

**SONY®**

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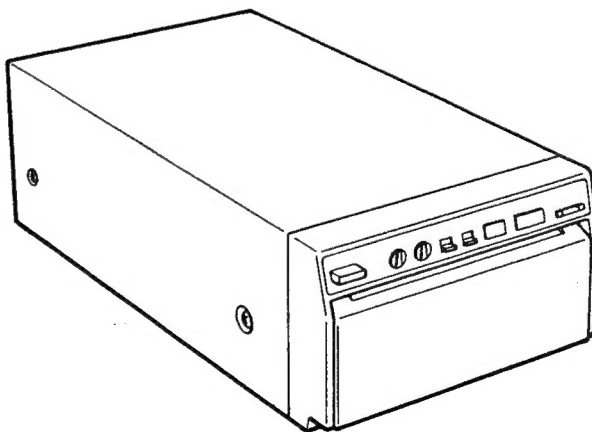
VIDEO GRAPHIC PRINTER

**UP-860**  
**UP-870MD**

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**SERVICE MANUAL**

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**Note :** Please caution for the model serial No.  
when changing the power supply section.

	Model Serial Number	
	Less than 15891 (UP-860)	15891 and later (UP-860)
	Less than 35201 (UP-870MD)	35201 and later (UP-870MD)
Switching Regulator	1-413-694-11 to 13	1-413-694-14

### SAFETY-RELATED COMPONENT WARNING !!

COMPONENTS IDENTIFIED BY SHADING AND MARK  ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY. CIRCUIT ADJUSTMENTS THAT ARE CRITICAL TO SAFE OPERATION ARE IDENTIFIED IN THIS MANUAL. FOLLOW THESE PROCEDURES WHENEVER CRITICAL COMPONENTS ARE REPLACED OR IMPROPER OPERATION IS SUSPECTED.

### ATTENTION AUX COMPOSANTS RELATIFS À LA SÉCURITÉ!!

LES COMPOSANTS IDENTIFIÉS PAR UNE TRAME ET PAR UNE MARQUE  SUR LES SCHÉMAS DE PRINCIPE, LES VUES EXPLOSÉES ET LES LISTES DE PIÈCES SONT D'UNE IMPORTANCE CRITIQUE POUR LA SÉCURITÉ DU FONCTIONNEMENT. NE LES REMPLACER QUE PAR DES COMPOSANTS SONY DONT LE NUMÉRO DE PIÈCE EST INDIQUÉ DANS LE PRÉSENT MANUEL OU DANS DES SUPPLÉMENTS PUBLIÉS PAR SONY. LES RÉGLAGES DE CIRCUIT DONT L'IMPORTANCE EST CRITIQUE POUR LA SÉCURITÉ DU FONCTIONNEMENT SONT IDENTIFIÉS DANS LE PRÉSENT MANUEL. SUIVRE CES PROCÉDURES LORS DE CHAQUE REMPLACEMENT DE COMPOSANTS CRITIQUES, OU LORSQU'UN MAUVAIS FONCTIONNEMENT EST SUSPECTÉ.

## SAFETY CHECK-OUT

(US Model only)

After correcting the original service problem, perform the following safety checks before releasing the set to the customer:

1. Check the area of your repair for unsoldered or poorly-soldered connections. Check the entire board surface for solder splashes and bridges.
2. Check the interboard wiring to ensure that no wires are "pinched" or contact high-wattage resistors.
3. Check that all control knobs, shields, covers, ground straps, and mounting hardware have been replaced. Be absolutely certain that you have replaced all the insulators.
4. Look for unauthorized replacement parts, particularly transistors, that were installed during a previous repair. Point them out to the customer and recommend their replacement.
5. Look for parts which, though functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.
6. Check the line cord for cracks and abrasion. Recommend the replacement of any such line cord to the customer.
7. Check the condition of the monopole antenna (if any).

Make sure the end is not broken off, and has the plastic cap on it. Point out the danger of impalement on a broken antenna to the customer, and recommend the antenna's replacement.

### LEAKAGE TEST

The AC leakage from any exposed metal part to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5 mA (500 microamperes). Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as the Simpson 229 or RCA WT-540A. Follow the manufacturers' instructions to use these instruments.
2. A battery-operated AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.
3. Measuring the voltage drop across a resistor by means of a VOM or battery-operated AC voltmeter. The "limit" indication is 0.75 V, so analog meters must have an accurate low-voltage scale. The Simpson 250 and Sanwa SH-63Trd are examples of a passive VOM that is suitable. Nearly all battery operated digital multimeters that have a 2V AC range are suitable. (See Fig. A)

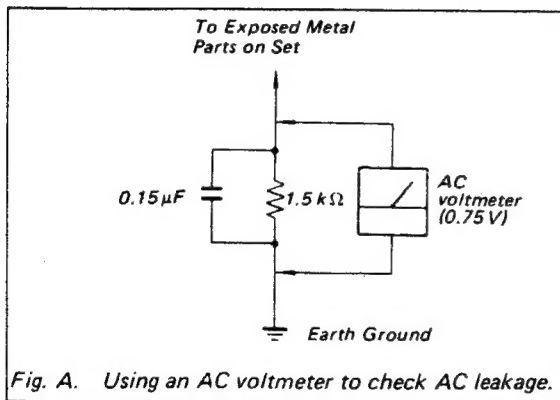


Fig. A. Using an AC voltmeter to check AC leakage.

## **SECTION 1**

### **GENERAL**

#### **1-1. OVERVIEW**

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The UP-860/870MD is a black and white video graphic printer that can be used to print images displayed on video equipment.

#### **Clear, consistent print quality**

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- High definition, 8.9 dots/mm printing using a thermal head with high-speed drive IC.
- 256 graduations of black and white

#### **Fast printing**

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- You can make a single print-out in about 3.9 seconds
- You can make a maximum of 11 copies of the same image continuously. Also, you can save your paper by using the paper saving function.

#### **Output modes**

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- You can make print-outs starting either from the bottom or top of the image by setting the DIRECTION DIP switch.
- You can set the print-out aspect ratio to 4:3 or 1:1 by setting the ASPECT DIP switch.
- You can set the range to be printed by setting the SCAN MODE DIP switch.

#### **Automatic video signal discrimination**

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The type of input black and white video signal (EIA or CCIR) or input color video signal (NTSC or PAL) is automatically discriminated and printed; there is no need to change any switch manually.

#### **Alarm buzzer**

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The alarm buzzer function prevents you from making any misoperation.

#### **Loading paper easy and quickly**

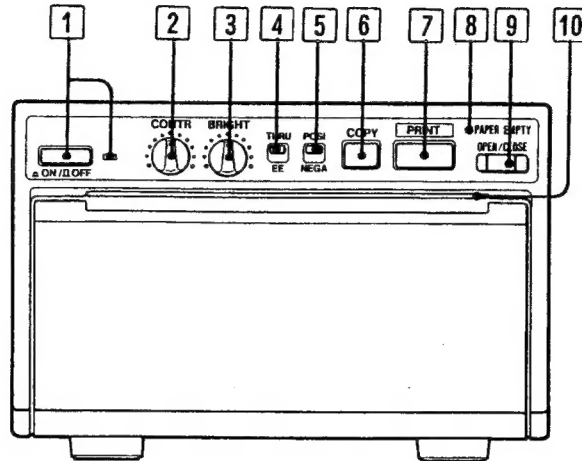
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You can load paper just by opening the paper lid with the OPEN/CLOSE button and placing the paper roll.

## 1-2. LOCATION AND FUNCTION OF PARTS AND CONTROLS

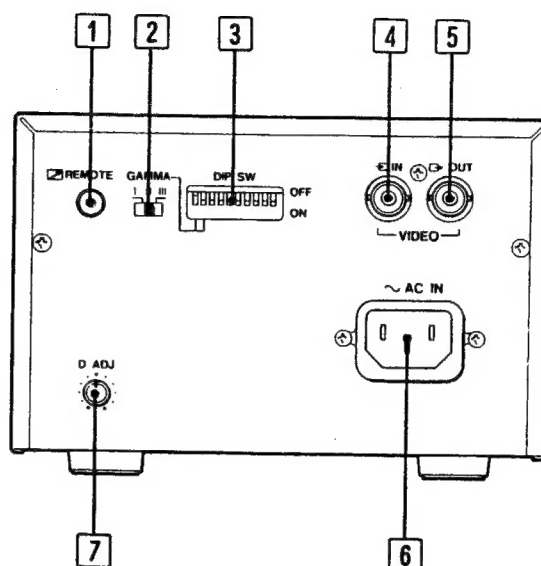
Refer to the pages indicated in the circles for details.

### Front Panel



- |  |  |
|--|--|
| <p><b>1 Power ON/OFF switch and indicator</b><br/>Press to turn the power on. The indicator is lit while the power is on.</p> <p><b>2 CONTR (contrast) control 15</b><br/>Use this control to adjust the contrast of the print-outs.</p> <p><b>3 BRIGHT (brightness) control 15</b><br/>Use this control to adjust the brightness of the print-outs.</p> <p><b>4 THRU/EE selector 15</b><br/>Use this selector to select the video signal output from the VIDEO OUT connector.<br/><b>THRU:</b> input signals are output directly to the video monitor.<br/><b>EE:</b> input signals are output to the video monitor after being processed by the printer's circuitry.</p> <p><b>5 POSI/NEGA selector 17</b><br/>Use this selector to switch between positive and negative print-outs.</p> | <p><b>6 COPY button 17</b><br/>Press this button to output another copy of the previous print-out.</p> <p><b>7 PRINT button 16</b><br/>Press this button to print the picture currently displayed on the monitor.<br/>The picture displayed when you press the PRINT button is stored on memory.</p> <p><b>8 PAPER EMPTY indicator</b><br/>This indicator lights when the printer is out of paper.</p> <p><b>9 OPEN/CLOSE button</b><br/>Press to open or close the door. Also, press this button to stop printing midway.</p> <p><b>10 Paper feeder and cutter</b><br/>Use to cut the printing paper.</p> |
|--|--|

## Rear panel



**1 REMOTE connector (stereo minijack) .. UP-860**  
Connect to the FS-20 foot switch (not supplied) for controlling print operation from a distance.

**1 REMOTE connector (stereo minijack) .. UP-870MD**  
Connect to the RM-91 remote commander (supplied) for controlling print operation from a distance.

**2 GAMMA selector**  
This selector changes the print mode to that for high-density printing paper. This selector is effective when the PAPER DIP switch is set to TYPE II.  
I : Soft graduation  
II : Standard  
III: Hard graduation

**3 DIP switches ⑨**  
These switches set the print modes and functions.

**4 VIDEO IN (video input) connector (BNC type) ⑧**  
Connect to the video output connector of the video equipment.

**5 VIDEO OUT (video output) connector (BNC type) ⑧**  
Connect to the video input connector of the video monitor. The output signal type depends on the setting of the THRU/EE selector.

**6 AC IN (AC power input) connector ⑧**  
Connect to a wall outlet, using the supplied AC power cord.

**7 D ADJ (fine adjusting) control**  
Usually, there is no need to use this control. Use it only when you have to make a fine adjustment of the density when you cannot control the brightness using the BRIGHT control.

## 1-3. PRECAUTIONS

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### On safety

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**Check the operating voltage before operation**

Operate the unit only with a power source specified in "Specifications".

**Stop operation immediately if any liquid or solid object falls into the cabinet.**

Unplug the unit and have it checked by qualified personnel.

**Unplug the unit from the wall outlet if you will not be using it for a long time.**

Disconnect the cord by grasping the plug. Never pull the cord itself.

**Do not disassemble the cabinet.**

Refer servicing to qualified personnel only.

**Do not touch the cutting blade of the printer.**

**Connect the power plug of the printer to the wall outlet having protective earth terminal.**

The safety earth should be properly established.

### On operation

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**Do not turn the power off while the printer is printing.**

Otherwise, the thermal head may be damaged.

### On printer carriage

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**Do not carry and move the printer when the paper roll is placed in the printer.**

If you do, this may cause trouble.

### On installation

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**Provide adequate air circulation to prevent heat build-up.**

Do not place the unit on surfaces such as rugs, blankets, etc., or near materials such as curtains and draperies.

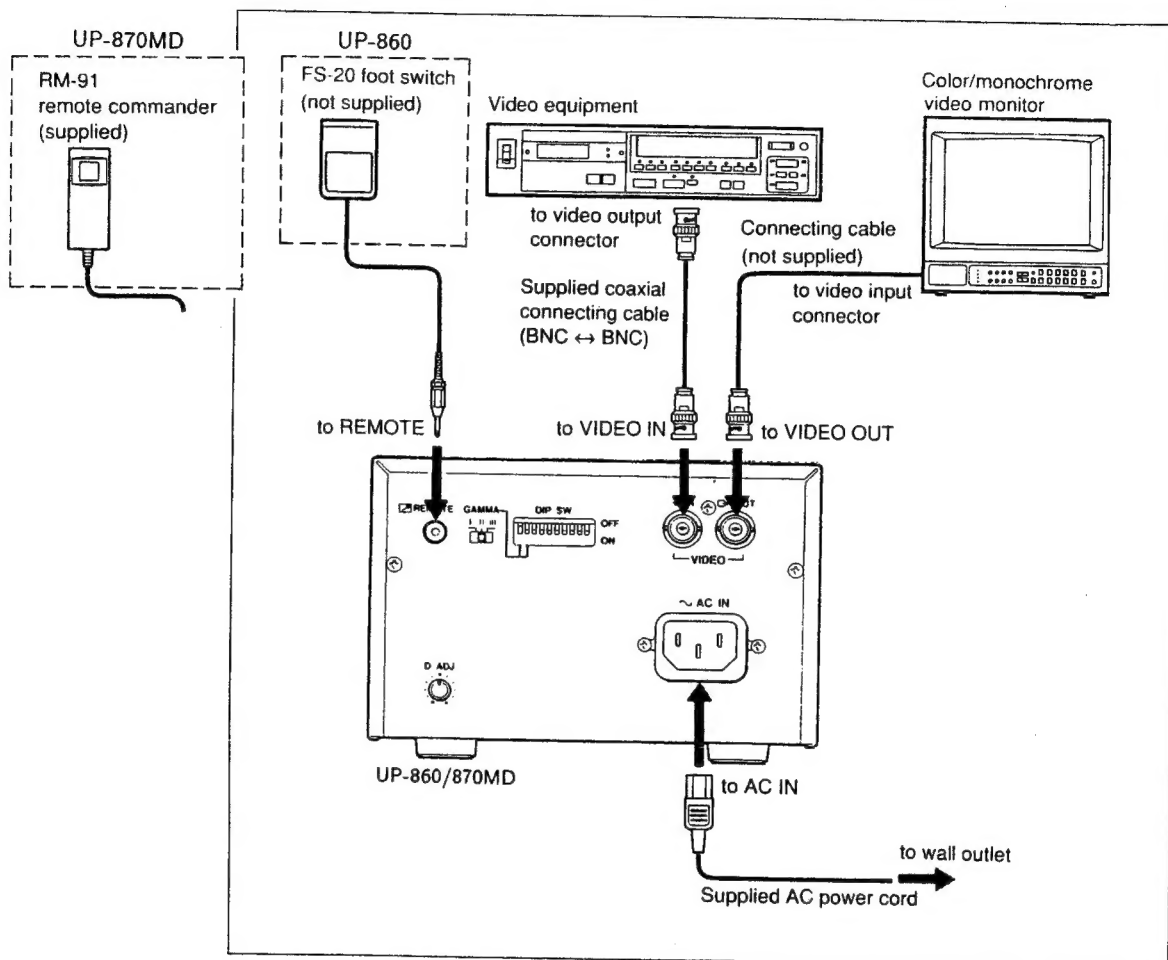
**Place the printer on a level, stable surface during operation.**

Do not install the printer near heat sources. Avoid locations near radiators or air ducts, or place subject to direct sunlight or excessive dust, humidity, mechanical shock or vibration.

## 1-4. CONNECTION

### Notes on connection

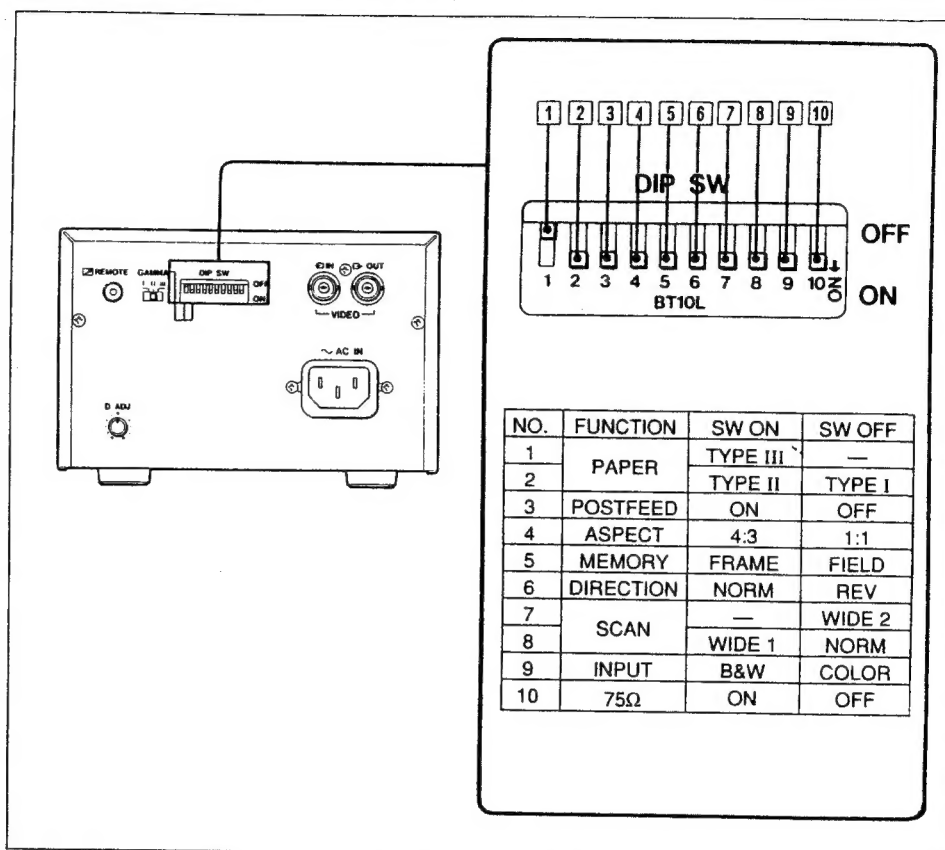
- Turn off the power to each device before making connections.
- Connect the AC power cord last.





## 1-5. SETTING THE DIP SWITCHES

Set the DIP switches according to the required print mode. Before setting the DIP switches, turn the power off. Change the settings using a small pointed tool such as a small screwdriver. The factory setting are as follows.



### 1 PAPER switch

Leave the PAPER 1 switch at the factory-set position.

### 2 PAPER switch

Set the PAPER 2 switch according to the type of printing paper being used. For details of the paper, see page 12.

Type of printing paper	Switch position
UPP-110S, UPP-110	TYPE I (normal)
UPP-110HD	TYPE II (high density)

### 3 POSTFEED switch

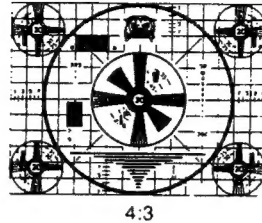
To feed out extra blank paper once a picture has been printed, set this switch to ON.

To save paper by feeding only a short length of paper after printing a picture, set this switch to OFF. You can make more print-outs per roll of printing paper with this switch set to OFF. But, you have to take out and cut the paper yourself.

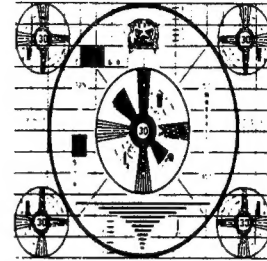
**4**

#### ASPECT switch

Normally, keep this switch set to 4:3. When the aspect ratio of the video signal is 1:1, set this switch to 1:1. The print-out will be longer than a print-out made at 4:3.



4:3



1:1

**5**

#### MEMORY switch

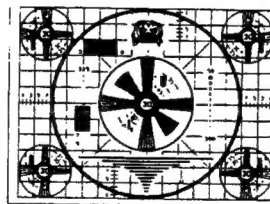
Normally keep this switch set to FRAME. When printing fast-moving pictures (such as a ball being thrown), the print-out may blur. If this happens, set this switch to FIELD. The print-out definition will be poorer but less blurred.

**6**

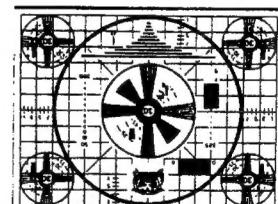
#### DIRECTION switch

Use this switch to select whether the top or bottom of the screen is to be printed first.

Normally, keep this switch set to NORM. Printing is done from the bottom of the screen. To start printing from the top of the screen, set this switch to REV.



NORM

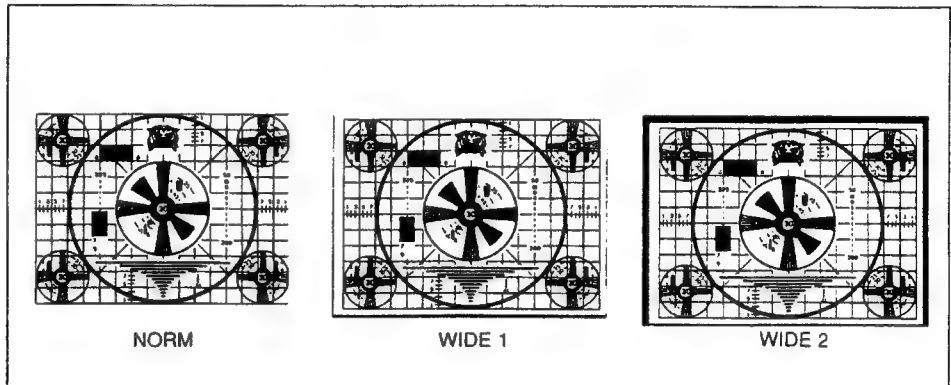


REV

**7 8 SCAN switches**

By setting the switches to the appropriate position, the printout range can be widened in the NORM – WIDE 1 – WIDE2.

To print only the image displayed on the standard screen size of the video monitor, set the SCAN switch **8** to NORM. To print when the signal scans beyond the edge of the standard monitor screen, set the SCAN switch **8** to WIDE 1 or the SCAN switch **7** to WIDE 2. When you select the WIDE 2 position, WIDE 2 is selected regardless of the setting of the SCAN DIP switch **8**.



**9 INPUT switch**

Set this switch to OFF (COLOR) when the input signal to be printed is a color signal. Set it to ON (B & W) when the signal is a black and white signal.

**10 75Ω switch**

Set this switch to OFF when you connect video equipment to the VIDEO OUT connector.

Set this switch to ON when you do not connect video equipment to the VIDEO OUT connector.

When you want to connect two printers to the video equipment, set either of the two printer's 75Ω switch to ON, and the switch of the other to OFF.

## 1-6. LOADING PAPER

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### On the Paper

#### Type of paper

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The use of paper other than Sony paper may result in reduced printer performance and poor print quality.  
Use only UPP-110 series paper.

Printer	Type of paper
TYPE I (Normal)	UPP-110S
TYPE II (High Density)	UPP-110HD

#### Storing paper

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**Do not leave unused paper in hot or humid locations.**

Do not leave unused paper in direct sunlight or other bright locations for extended periods.

**Store unused or printed paper in a cool, dark place (below 30°C or 86°F)**

We recommend that you store printed paper in a polypropylene pouch.

**Do not allow any volatile organic solvent or vinyl chloride to come into with the printed paper.**

Alcohol, plastic tape or film will fade the print-out. To attach printed paper to another piece of paper, use double-sided adhesive tape, or water-based or solid glue.

**Do not stack printed paper or under a freshly-developed diazo copy sheet.**

Otherwise, the printout may become discolor in black.

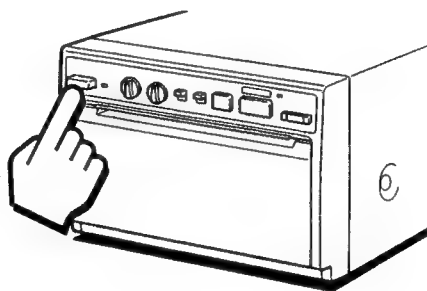
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## Loading Paper

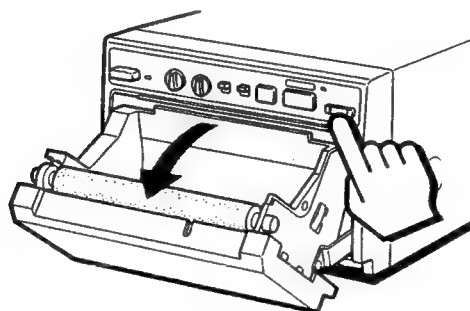
### Before loading paper

Do not fold the paper or touch the printing surface. Dust on the printing surface will result in poor print quality. When loading the paper roll, take up any slack by pulling out and cutting off the first 15 to 20 cm (6 to 7<sup>7</sup>/<sub>8</sub> inches) paper. Otherwise, the print quality will not be satisfactory and the printer may malfunction.

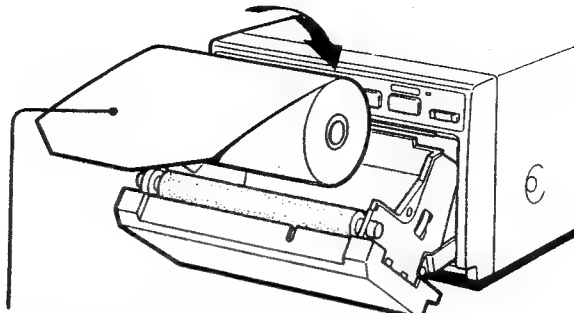
- 1** Press the power ON/OFF switch to turn the printer on.



- 2** Press the OPEN/CLOSE button to open the paper lid.

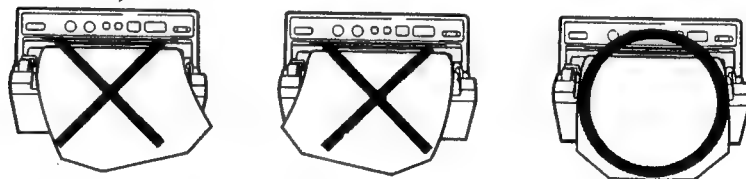
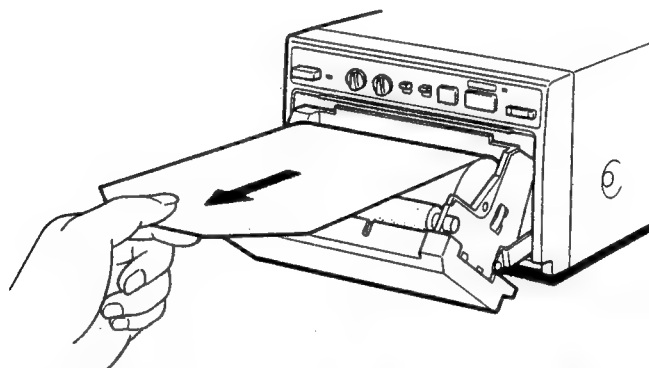


**3 Place the paper roll in the printer.**

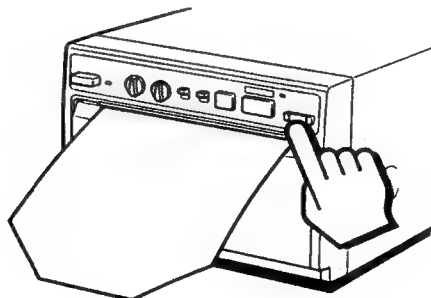


Place the paper with the thermo-sensitive side (printing side) up.

**4 Pull out the first 15 to 20 cm of the paper to remove any slack in the roll.**



**5 Press the OPEN/CLOSE button to close the paper lid.**  
You can also close the paper lid simply by pushing it.



## 1-7. MAKING PRINT-OUTS

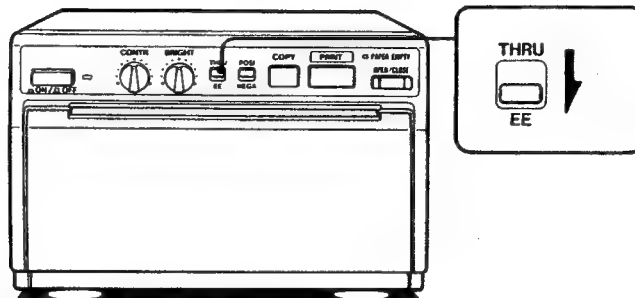
### Adjusting the Contrast and Brightness of the Print-Out

You can adjust the contrast and brightness of your print-outs.

**1**

**Set the THRU/EE selector to EE.**

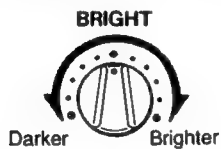
Using the video monitor, you can check the picture of a signal processed by the printer's circuitry.



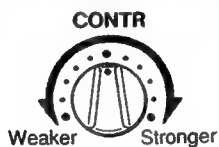
**2**

**Adjust the brightness and contrast by using the BRIGHT and CONTR controls while watching the picture on the video monitor.**

Adjusting the brightness → BRIGHT control



Adjusting the contrast → CONTR control



By setting the THRU/EE selector to THRU, you can check the picture of signals input to the printer and directly output to the video monitor without being processed by the printer's circuitry.

## Printing a Picture

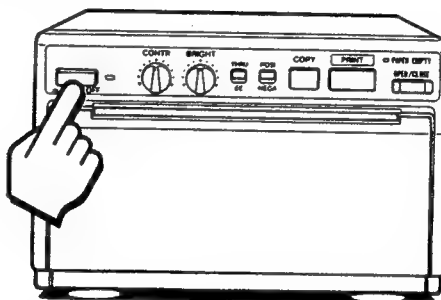
### Before making print-outs

- Be sure that the DIP switch settings are correct (see page 9).
- Be sure that all connections are correct and that the print source is connected to the printer's VIDEO IN connector.
- Be sure that the paper roll is loaded properly (see page 12).

### Printing a picture

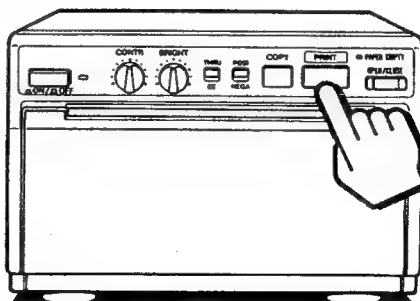
To print a picture, follow the steps below.

- 1 Press the power ON/OFF switch to turn the printer on.**  
The power indicator lights.



- 2 Make sure that the PAPER EMPTY indicator is not lit.**  
If lit, load paper.

- 3 Press the PRINT button when the video monitor displays the picture you want to print is on the video monitor.**  
The printer makes a print-out of the picture displayed at the instant you press the PRINT button.





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### **Stopping printing midway**

Press the OPEN/CLOSE button while printing or while copying. The printer stops printing.

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### **Stopping printing to print another picture displayed on the screen**

Press the PRINT button while printing or while copying. The printer stops printing and starts to make a print-out of the picture displayed at the instant you press the PRINT button.

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### **Making copies of the previously output image**

Press the COPY button. The printer makes a copy of the previous print-out. The last print-out is retained in the printer's memory until you press the PRINT button again or turn the power off.

#### **Note**

The buzzer will sound if you press the COPY button immediately after turning the power on. (Nothing is stored in memory.)

---

### **Making multiple copies of the same print-out**

Press the COPY button as many times as necessary (maximum 11 copies including the first print-out) while printing or copying the first print-out. Each time you press the COPY button, the buzzer sounds briefly.

#### **To stop copying midway**

Press the OPEN/CLOSE button.

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### **Making negative print-outs**

Set the POSI/NEGA switch to NEGA.

Black and white as displayed  
on the video monitor



Black and white, negative

### Cleaning the Cabinet

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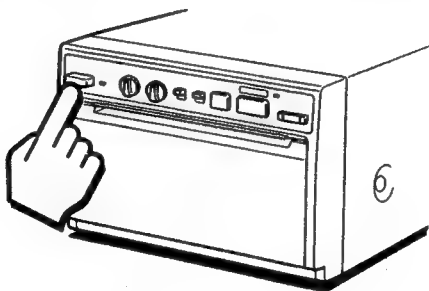
Do not use strong solvents to clean the printer.  
Thinner or abrasive cleansers will damage the cabinet.

### Cleaning the thermal head

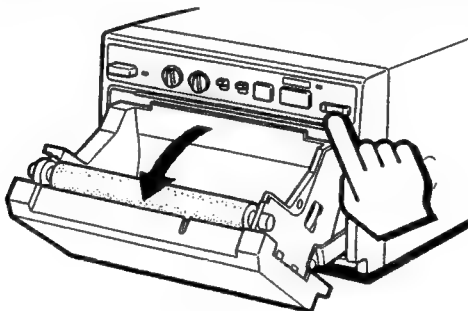
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If the print-out is dirty or while stripes appear on the print-outs, clean the thermal head using the supplied cleaning sheet.

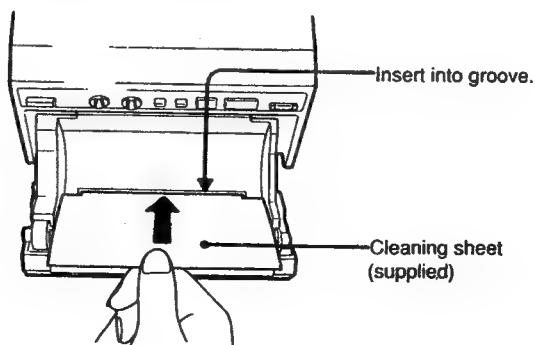
- 1** Press the power ON/OFF switch to turn on the printer.



- 2** Press the OPEN/CLOSE button to open the paper lid.



- 3** Insert the cleaning sheet, with the black surface facing down, into the groove in the paper lid.



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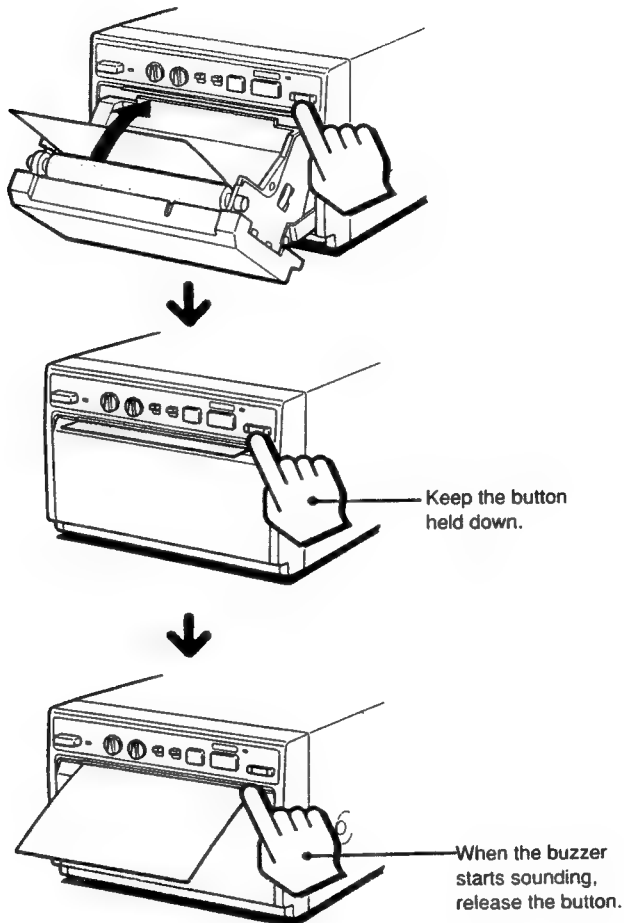
**4**

**Press the OPEN/CLOSE button and hold it down.**

The paper lid closes and the printer starts cleaning the head.

**Keep the OPEN/CLOSE button held down until the buzzer starts sounding and the printer starts ejecting the cleaning sheet.**

(The buzzer sounds throughout the cleaning process.)



**5**

**Remove the cleaning sheet.**

**Notes**

- Never press the PRINT or COPY button while the cleaning sheet is in the printer.
- Clean the head only when necessary. If you clean the head too often, it may cause malfunctions.

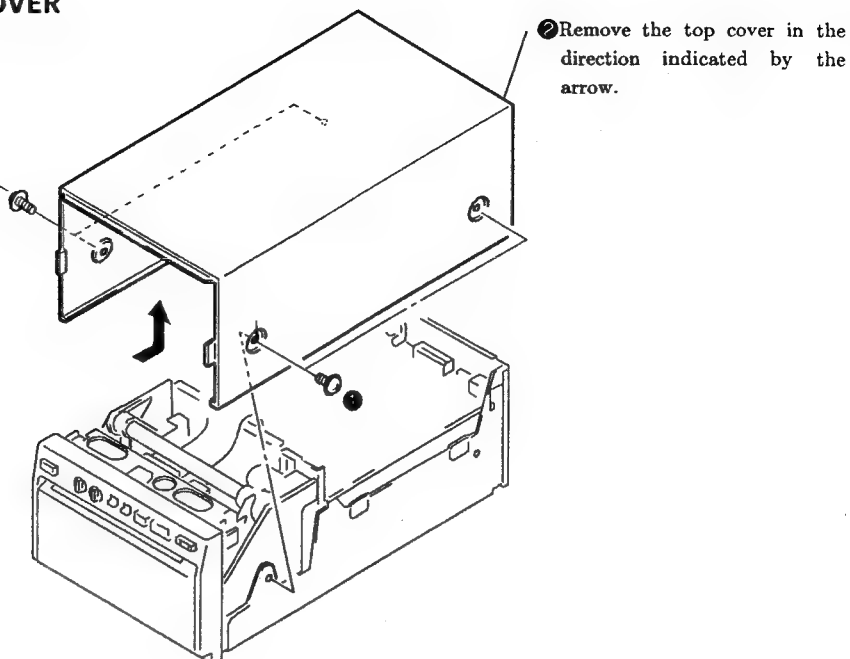
# Troubleshooting

Symptom	Cause/remedy Refer also to the pages indicated by ●.
White specks on first few print-outs.	When printing with a newly inserted roll of paper, dust on the surface of the paper may cause white specks on the print-outs. → Feed the paper by pressing the OPEN/CLOSE button until clean paper appears.
Printing does not start when you press the PRINT button.	<ul style="list-style-type: none"> <li>• Paper is not fed. → Is the paper slack? → Is the power turned on? → Are all connections correct? (page 8)</li> <li>• When the alarm buzzer sounds: → Has the thermal head overheated? → Is the video signal of the picture you want to print being input? → Is the paper loaded correctly?</li> <li>• Paper is fed, but printing does not start. → Is the paper loaded with the thermo-sensitive side up?</li> </ul>
Black borders or missing portions around the print-out	This may result according to the video signal input to the printer. → Change the setting of the SCAN DIP switches. (page 10)
Paper jam	<ul style="list-style-type: none"> <li>• Open the paper lid by pressing the OPEN/CLOSE button, then remove the jammed paper by slowly pulling it.</li> <li>• Is there any condensation within the unit? → Moving the unit suddenly from a cold place to a warm place often results in condensation forming. In the event of condensation forming, remove the paper, turn off the power, and leave the unit for about one to two hours.</li> </ul>
Print-out is dirty.	Is the thermal head dirty? → Clean the thermal head with the supplied head cleaning sheet (page 18).
The printer stops printing when it prints continuously black pictures.	This is likely to occur when the printer prints continuously 15 or more black pictures. In such a case, the buzzer sounds. This is because that the protective circuit works against heat built-up of the thermal head. Stop printing for a while.
White lines or small letters on the screen are not printed clearly.	Is the INPUT DIP switch set to COLOR when the input signal is a black and white signal?
Small squares appear over the whole screen.	Is the INPUT DIP switch set to B & W when the input signal is a color signal?
The print-out is too dark or too light.	Is the 75Ω switch set correctly? (page 11) Is the GAMMA DIP switch set correctly? (page 6)
The print-out seems stretched.	Is the ASPECT DIP switch set to 1:1?

## SECTION 2 DISASSEMBLY

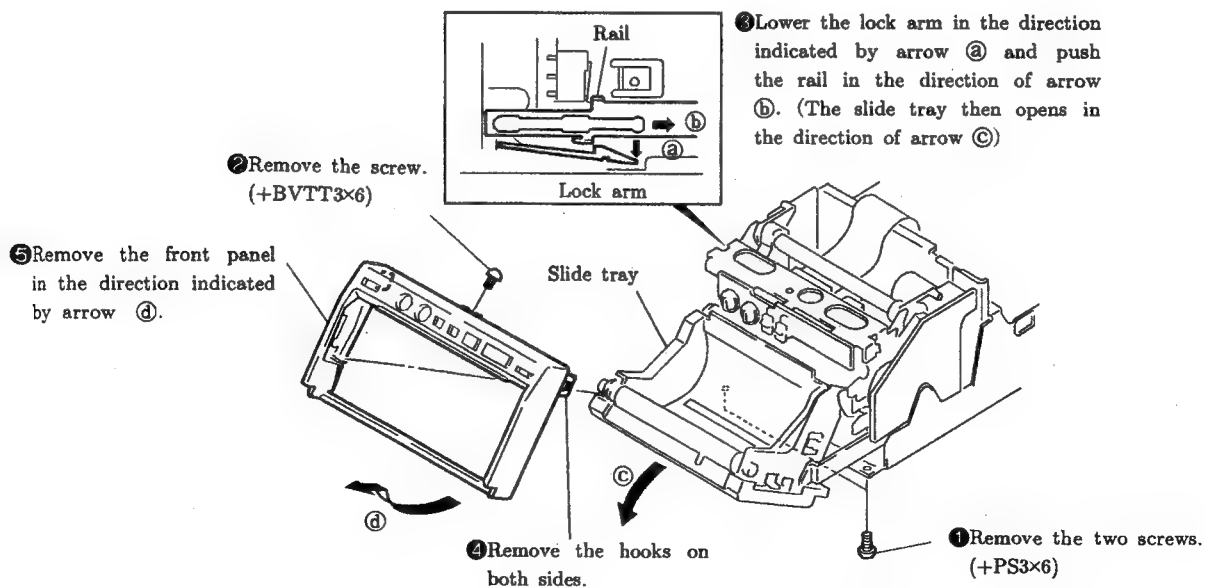
### 2-1. REMOVAL OF TOP COVER

- ① Remove the four screws.  
(Screw, M3 case)



### 2-2. REMOVAL OF FRONT PANEL

※ To remove the slide tray without turning on the power, pull out the slide tray while pushing up the Lever at the bottom of the set backward.



## 2-3. REMOVAL OF MA-14 BOARD

- ① Remove the ten connectors

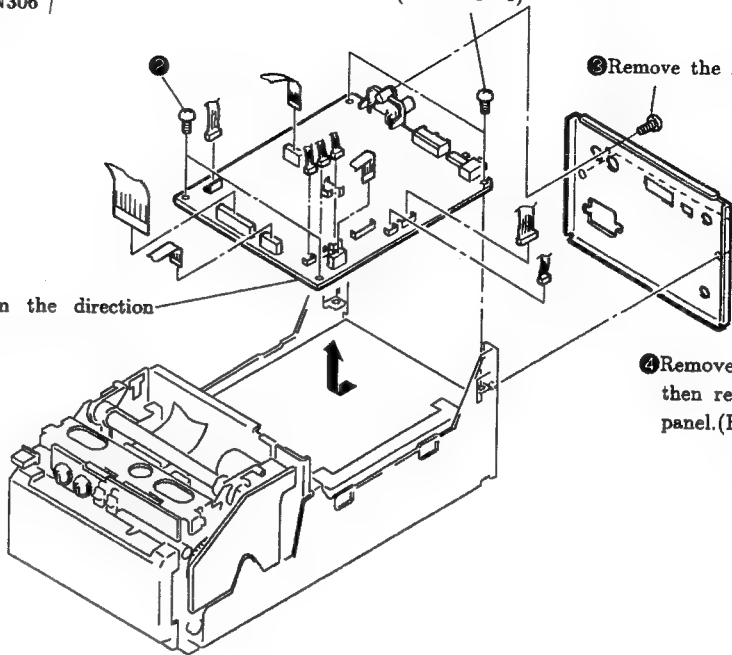
(CN2, CN51, CN101, CN201, CN202,  
CN301, CN303, CN304, CN305, CN306)

- ② Remove the four screws.  
(BVT 3×6)

- ③ Remove the screws. (B3×8)

- ⑤ Remove the MA-14 board in the direction  
indicated by the arrow.

- ④ Remove two screws,  
then remove the rear  
panel. (BVT 3×6)



## 2-4. REMOVAL OF MECHANISM BLOCK

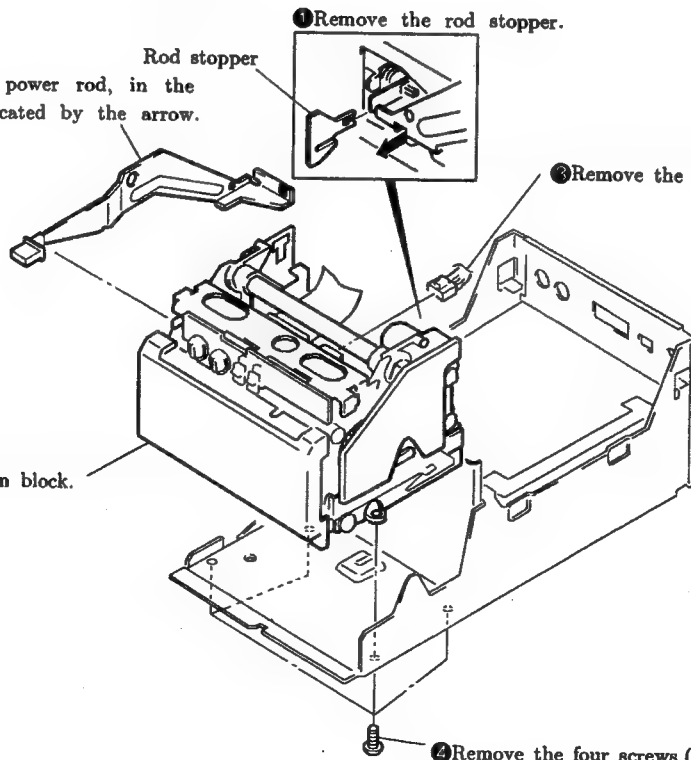
- ① Remove the rod stopper.

- ② Remove the power rod, in the  
direction indicated by the arrow.

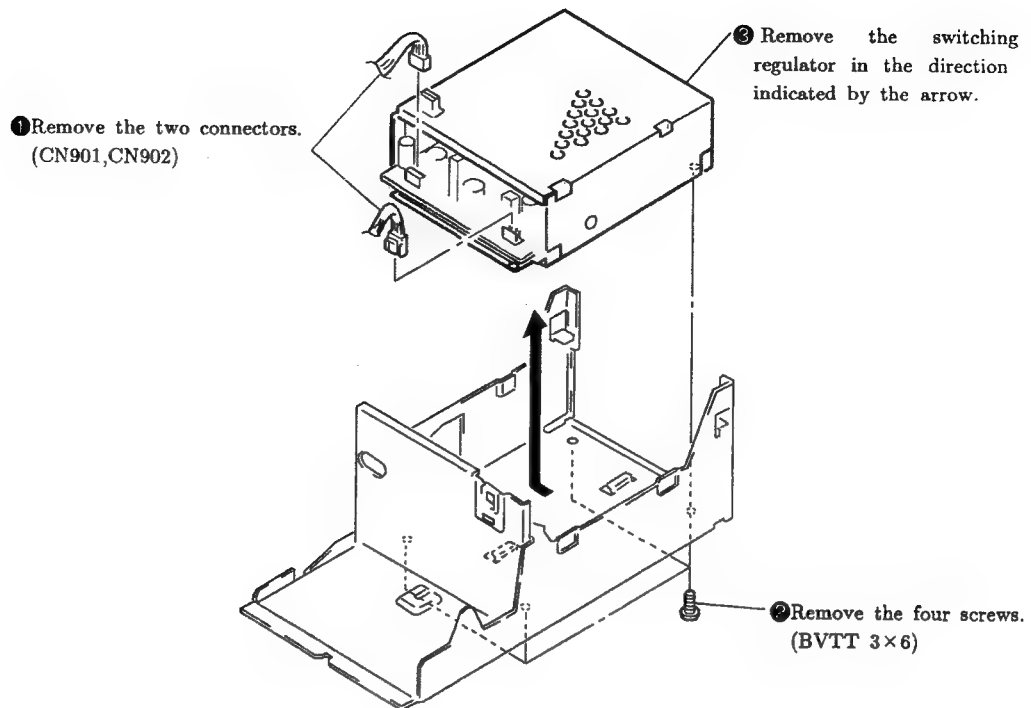
- ③ Remove the connector.

- ⑤ Remove the mechanism block.

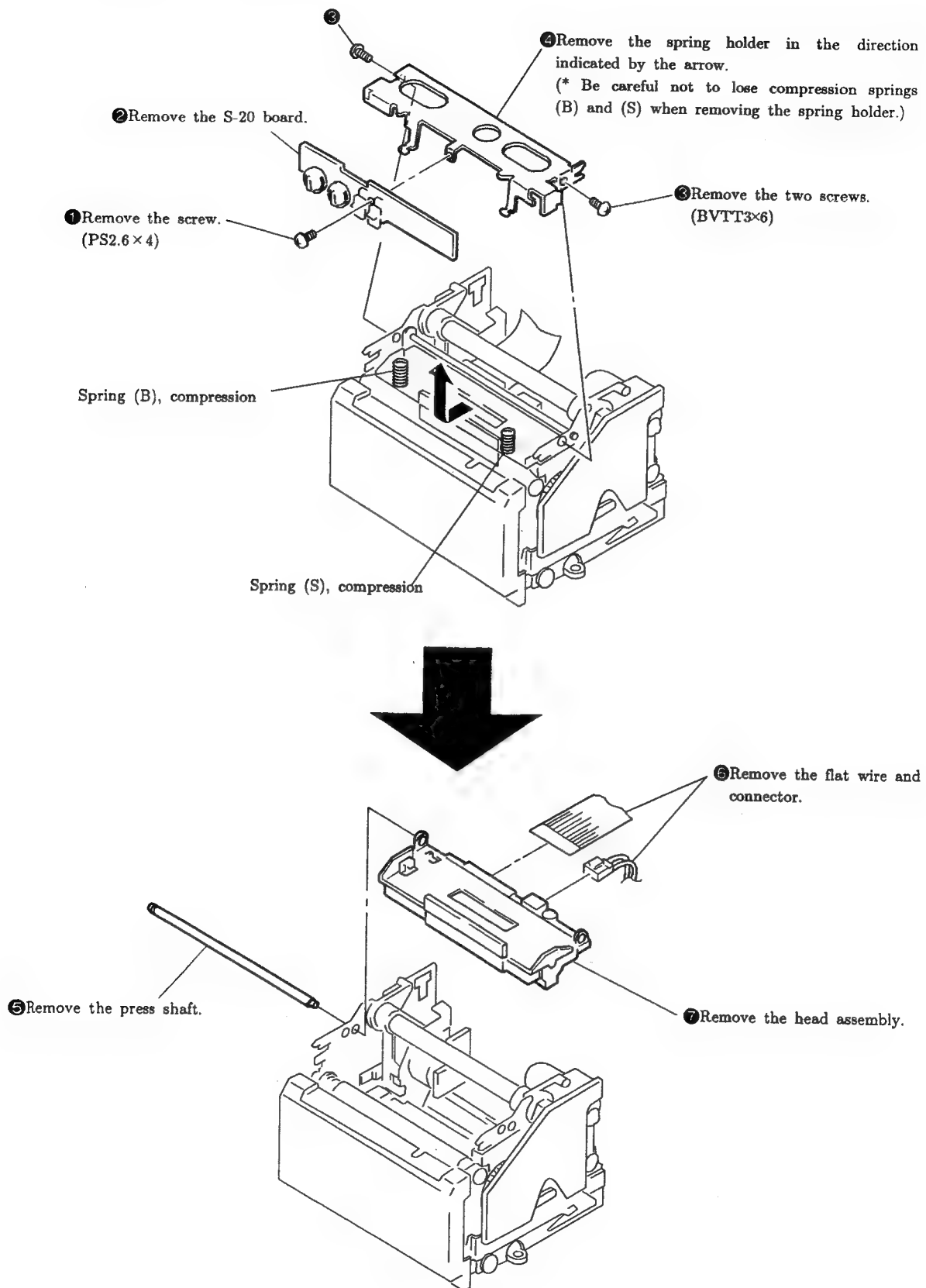
- ④ Remove the four screws. (BVT 3×6)



## 2-5. REMOVAL OF REAR PANEL AND SWITCHING REGULATOR



## 2-6. REMOVAL OF THERMAL HEAD




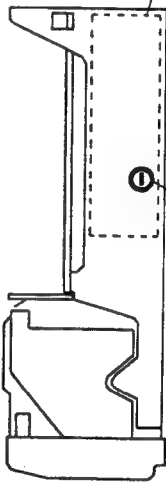


## SECTION 3 ADJUSTMENTS

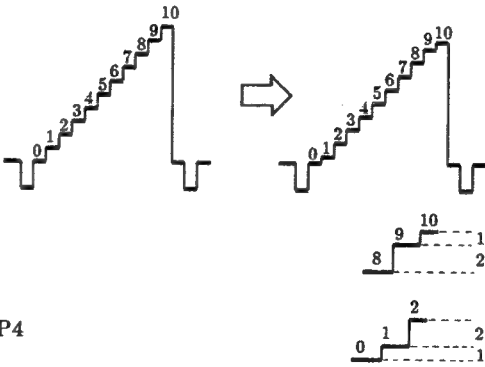
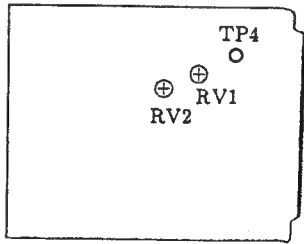
### Measuring Equipment Required

1. Oscilloscope
2. Frequency counter
3. Color-bar pattern generator (1410 and 1411 signal generator)
4. Digital multimeter

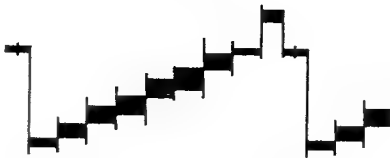
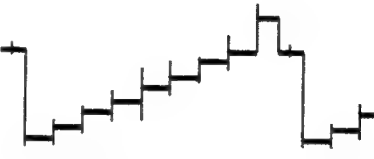
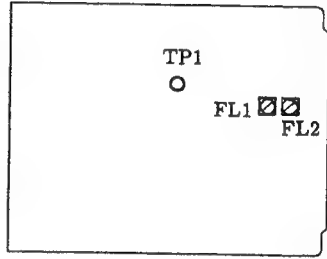
### 3-1. HEAD VOLTAGE ADJUSTMENT

Conditions for adjustment	Specification	Adjustment
<ul style="list-style-type: none"> <li>Input signal: NTSC signal (1410 signal generator)</li> <li>Turn on the POWER switch while pressing the <b>PRINT</b> and <b>COPY</b> buttons at the same time.</li> </ul> <p>Note:</p> <p>Do not release the switch until the buzzer sounds.</p> <ul style="list-style-type: none"> <li>For printing-out, press the <b>PRINT</b> button.</li> <li>Set DIP switches 2 through 8 to ON (lower position), and set DIP switch 1 to OFF.</li> <li>Use the UPP-110HD paper.</li> <li>Set the GAMMA slide switch to the center position (II).</li> <li>Set the D. ADJ. variable resistor (RV903) of a switching regulator to the center position.</li> </ul>	 <p style="text-align: center;">Fig. 1</p> <p>Adjust RV901 to make the 17-step gradation signal smooth as shown in Fig. 1.</p>	<p>● RV901</p> <p>Switching regulator</p> 

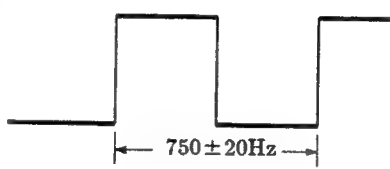
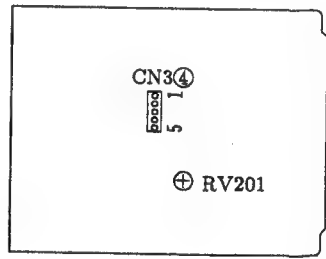
### 3-2. BRIGHTNESS CONTRAST ADJUSTMENT

Conditions for adjustment	Specification	Adjustment
<ul style="list-style-type: none"> <li>Input signal: 10-step signal (1410 signal generator)</li> <li>Set the <b>CONTR</b> and <b>BRT</b> control knobs to the center position.</li> </ul>	 <p>TP4</p>	<p>● RV1/C-2 (MA-14)</p> <p>● RV2/C-2 (MA-14)</p> 

### 3-3. TRAP ADJUSTMENT

Conditions for adjustment	Specification	Adjustment
<ul style="list-style-type: none"> <li>Input signal : NTSC color-bar (1410 signal generator)</li> <li>PAL color-bar (1411 signal generator)</li> <li>Set INPUT of DIP switch ⑨ to ON or OFF.</li> <li>Adjust FL1 when an NTSC color-bar signal is input, and adjust FL2 when a PAL color-bar signal is input.</li> </ul>	 <p>DIP-SW⑨ - ON(B&amp;W)</p> <p>↓</p>  <p>DIP-SW⑨ - OFF(COLOR)</p> <p>TP1</p>	<ul style="list-style-type: none"> <li>● FL1/D-2 (MA-14)</li> <li>● FL2/D-2 (MA-14)</li> </ul> 

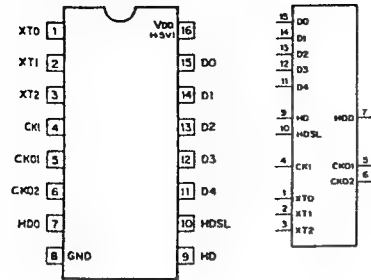
### 3-4. MOTOR SPEED ADJUSTMENT

Conditions for adjustment	Specification	Adjustment
<ul style="list-style-type: none"> <li>Input signal : Color-bar (1410 signal generator)</li> <li>Press the <b>PRINT</b> button to measure the waveform at pin ④ of connector CN3.</li> <li>Set DIP switches 2 through 8 to ON (lower position), and set DIP switch 1 to OFF.</li> <li>Use the UPP-110HD paper.</li> </ul> <p>Note: Do not adjust while a print blank strip is fed.</p>	 <p>CN3④</p>	<ul style="list-style-type: none"> <li>● RV201/C-3 (MA-14)</li> </ul> 

## SECTION 4 DIAGRAMS

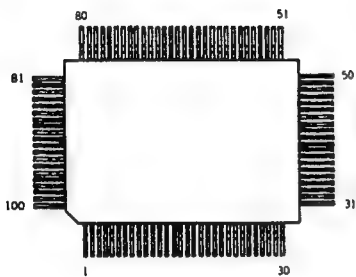
### 4-1. SEMICONDUCTORS

CXD1332P (SONY)

C-MOS SEMI-CUSTOM LSI  
— TOP VIEW —

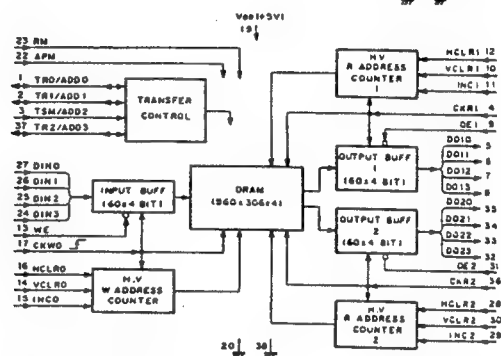
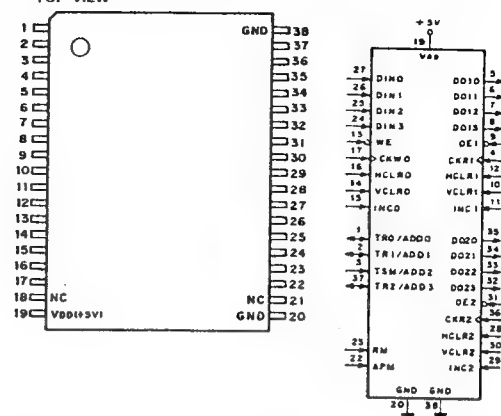
CXD8284Q (SONY)

— TOP VIEW —



No.	I/O	Name	No.	I/O	Name	No.	I/O	Name	No.	I/O	Name
1	-	VCC	26	O	SPCK	51	I	AD0	76	O	PWMD00
2	I	SRT0	27	O	COPING	52	I	BD1	77	O	PWMD01
3	I	SRT1	28	O	EXTV	53	I	BD0	78	O	PWMD02
4	I	SRT2	29	O	INTV	54	I	AD3	79	O	PWMD03
5	I	SRT3	30	O	MCK16	55	I	AD2	80	O	PWMD04
6	I	RMTEST	31	O	MCK1K	56	I	BD3	81	O	PWMD05
7	O	MONID0	32	-	GND	57	I	BD2	82	O	PWMD06
8	O	MONID1	33	I	STB	58	I	AD5	83	-	VCC
9	O	MONID2	34	I	DRIN	59	I	AD4	84	O	PWMD07
10	O	MONID3	35	I	COPY	60	I	BD5	85	O	PWMD08
11	O	MONID4	36	I	FETCH	61	I	BD4	86	O	PWMD09
12	O	MONIDS	37	I	RSTLD	62	-	VCC	87	O	PWMD10
13	-	GND	38	I	CPSTOP	63	O	HCLR0	88	O	PWMD11
14	I	FRTEST	39	-	VCC	64	O	INC0	89	O	PWMD12
15	I	TEXTH	40	O	DITH1	65	O	VCLR0	90	O	PWMD13
16	I	TEXTV	41	O	DITH2	66	O	WE0	91	-	GND
17	I	TODDEV	42	O	ODDEVN	67	O	HCLR1	92	O	THCK
18	I	TINTV	43	I	CSYNC	68	O	INC1	93	O	DROUT
19	I	TMODE	44	O	CKKOUT	69	O	VCLR1	94	O	STBOUT
20	I	FG	45	O	EXTH	70	O	CKR1	95	-	VCC
21	I	RESET	46	-	GND	71	O	HCLR2	96	I	M152N
22	I	NEGPOS	47	I	MCLK	72	O	INC2	97	I	ERR
23	I	SCK	48	I	CKIN	73	O	VCLR2	98	I	M1221
24	I	SI	49	I	HD0	74	O	CKR2	99	I	M3411
25	-	VCC	50	I	AD1	75	-	GND	100	I	5NROFF

CXK1206M (SONY) FLAT PACKAGE

C-MOS VIDEO FIELD MEMORY (960-COLUMNx306-ROWx4-BIT)  
— TOP VIEW —

PIN	SIGNAL	DESCRIPTION
1	TR0/ADD0	W PORT 0 TRANSFER SYNC I/O, ADDRESS 0 INPUT
2	TR1/ADD1	R PORT 1 TRANSFER SYNC I/O, ADDRESS 1 INPUT
3	TSM/ADD2	TRANSFER SYNCHRONOUS MODE, ADDRESS 2 INPUT
4	CKR1	R PORT 1 SHIFT SIGNAL INPUT
5	D0	R PORT 1 DATA 0 OUTPUT
6	D01	R PORT 1 DATA 1 OUTPUT
7	D02	R PORT 1 DATA 2 OUTPUT
8	D03	R PORT 1 DATA 3 OUTPUT
9	OE1	R PORT 1 OUTPUT ENABLE INPUT
10	VCLR1	R PORT 1 VERTICAL CLEAR INPUT
11	INC1	R PORT 1 LINE INCREMENT INPUT
12	HCLR1	R PORT 1 HORIZONTAL CLEAR INPUT
13	WE	W PORT 0 WRITE ENABLE INPUT
14	VCLR0	W PORT 0 VERTICAL CLEAR INPUT
15	INC0	W PORT 0 LINE INCREMENT INPUT
16	HCLR0	W PORT 0 HORIZONTAL CLEAR INPUT
17	CKR0	W PORT 0 SHIFT SIGNAL INPUT
18	NC	(no connection)
19	VDD	+5V INPUT
20	GND	GND
21	NC	(no connection)
22	APH	ADDRESS PRESET MODE INPUT
23	RAM	RECURSIVE MODE ENABLE INPUT
24	DIN3	W PORT 0 DATA 3 INPUT
25	DIN2	W PORT 0 DATA 2 INPUT
26	DIN1	W PORT 0 DATA 1 INPUT
27	DIN0	W PORT 0 DATA 0 INPUT
28	HCLR2	R PORT 2 HORIZONTAL CLEAR INPUT
29	INC2	R PORT 2 LINE INCREMENT INPUT
30	VCLR2	R PORT 2 VERTICAL CLEAR INPUT
31	OE2	R PORT 2 OUTPUT ENABLE INPUT
32	D023	R PORT 2 DATA 3 OUTPUT
33	D022	R PORT 2 DATA 2 OUTPUT
34	D021	R PORT 2 DATA 1 OUTPUT
35	D020	R PORT 2 DATA 0 OUTPUT
36	CKR2	R PORT 2 SHIFT SIGNAL INPUT
37	TR2/ADD3	R PORT 2 TRANSFER SYNC I/O, ADDRESS 3 INPUT
38	GND	GND

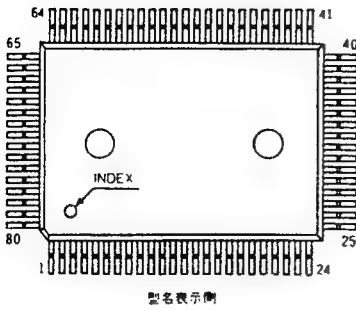
## MODE SELECTION

CONTROL INPUTS			T5, TR/ADD		MODE
RM	APH	TSM	TR 0-2	ADD 0-3	
0	0	0	OUT PUT	-	NON RECURSIVE MODE, TRANSFER SYNCHRONOUS MODE OUTPUT
0	0	1	IN-PUT	-	NON RECURSIVE MODE, TRANSFER SYNCHRONOUS MODE INPUT
0	1	-	-	IN-PUT	NON RECURSIVE MODE, ADDRESS PRESET MODE
1	0	0	OUT PUT	-	RECURSIVE MODE, TRANSFER SYNCHRONOUS MODE OUTPUT
1	0	1	IN-PUT	-	RECURSIVE MODE, TRANSFER SYNCHRONOUS MODE INPUT

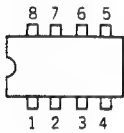
0:LOW LEVEL 1:HIGH LEVEL

# CXP80P116Q-2-031 (SONY)

- TOP VIEW -

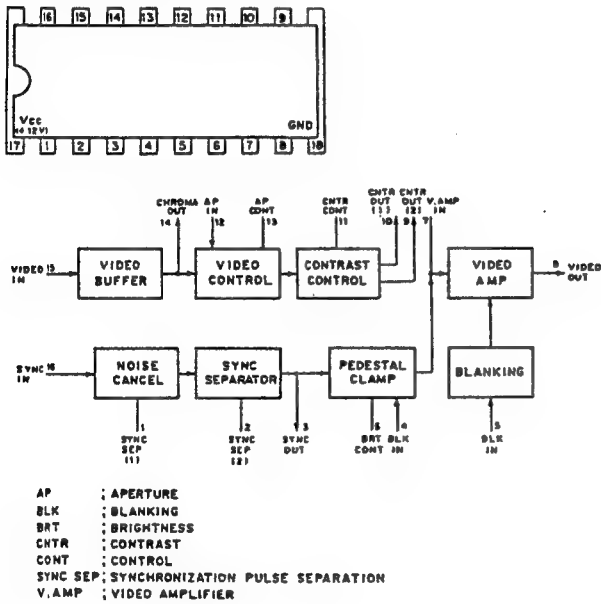


## TLP732GR-LF2



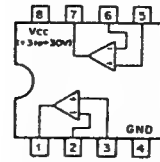
## HA11465A (HITACHI)

NTSC COLOR TV VIDEO AMPLIFIER  
- TOP VIEW -



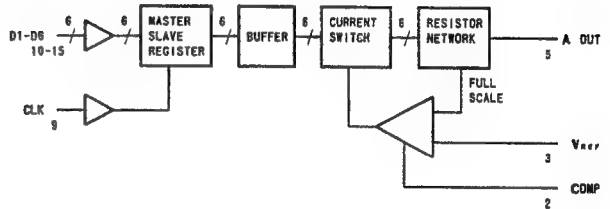
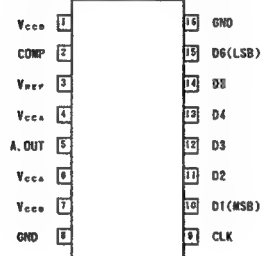
## LM358PS (TI) FLAT PACKAGE

DUAL OPERATIONAL AMPLIFIERS  
- TOP VIEW -

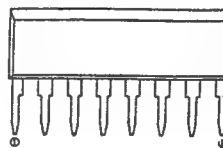


## MB40776PF (FUJITSU)

C-MOS 6 BIT D/A CONVERTER  
- TOP VIEW -

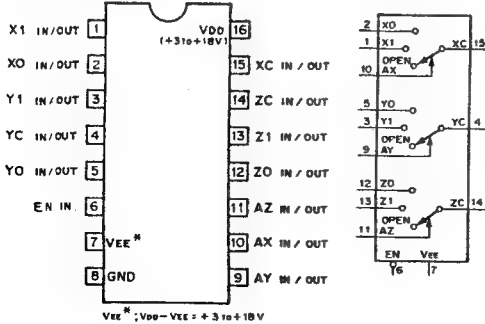


## M51970M (MITSUBISHI)



## HD14053BFP (MOTOROLA) FLAT PACKAGE

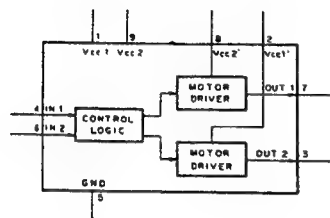
C-MOS TRIPLE 2-CHANNEL ANALOG MULTIPLEXER/DEMULTIPLEXER  
- TOP VIEW -



0; LOW LEVEL  
1; HIGH LEVEL  
X; DON'T CARE.

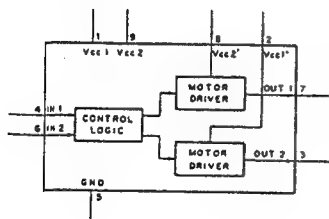
CONT. INPUTS		ON CHANNEL
EN	A (X,Y,Z)	
0	0	0
0	1	1
1	X	OPEN

BI-DIRECTINAL MOTOR DRIVER  
- SIDE VIEW -



0 : LOW LEVEL  
1 : HIGH LEVEL  
2 : HIGH IMPEDANCE

BI-DIRECTINAL MOTOR DRIVER  
— SIDE VIEW —



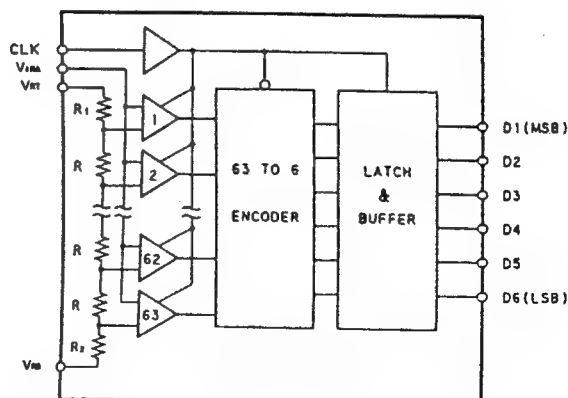
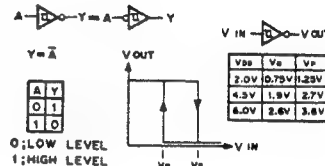
0: LOW LEVEL  
1: HIGH LEVEL  
2: HIGH IMPEDANCE

**POSITIVE VOLTAGE REGULATOR  
- TOP VIEW -**



OUTPUT VOLTAGE	NJM78M72FA	NJM7872FA	RC78M72FA	RC7872FA
+5V	NJM78M05FA	NJM7806FA	RC78M05FA	RC7806FA
+6V	NJM78M06FA	NJM7806FA	RC78M06FA	RC7806FA
+9V	NJM78M09FA	NJM7809FA	RC78M09FA	RC7809FA
+12V	NJM78M12FA	NJM7812FA	RC78M12FA	RC7812FA
+15V	NJM78M15FA	NJM7815FA	RC78M15FA	RC7815FA
+20V	NJM78M18FA	NJM7818FA	-----	RC7818FA
+24V	NJM78M20FA	NJM7820FA	-----	RC7820FA
+28V	NJM78M24FA	NJM7824FA	-----	RC7824FA

C-MOS SCHMITT TRIGGER INVERTER  
- TOP VIEW -



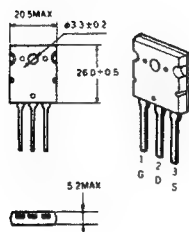
25A1162  
25C2712-G  
DTA124EK  
DTC124EK



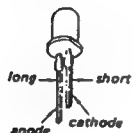
GL420  
GP1551  
PT421F



IRFP448



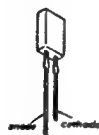
GL520



RD3.6M-B2  
RD5.6M-B2  
RD9.1M-B2  
1551B4



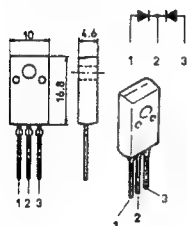
TLG211-GH  
TLY211



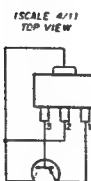
PT501-A



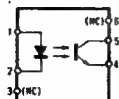
D105C9M



25B798-DL



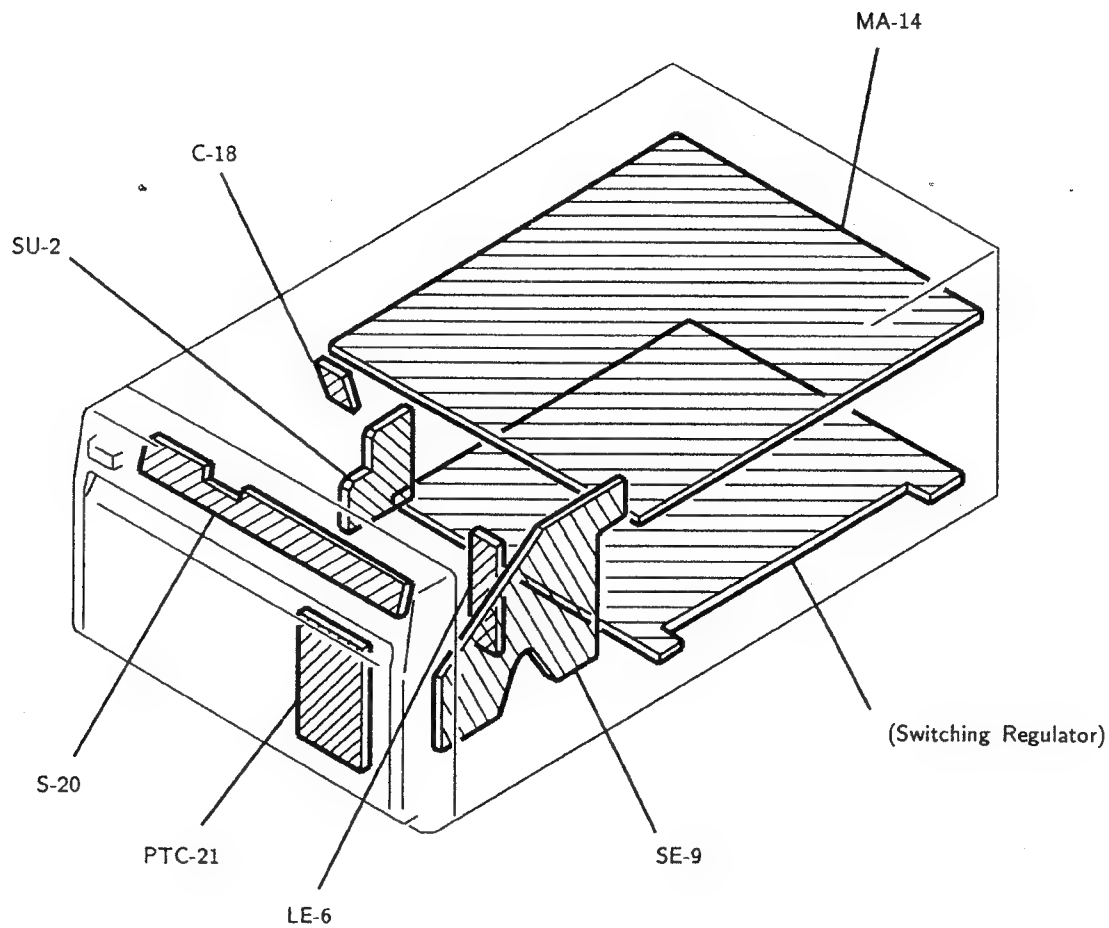
FA5304P



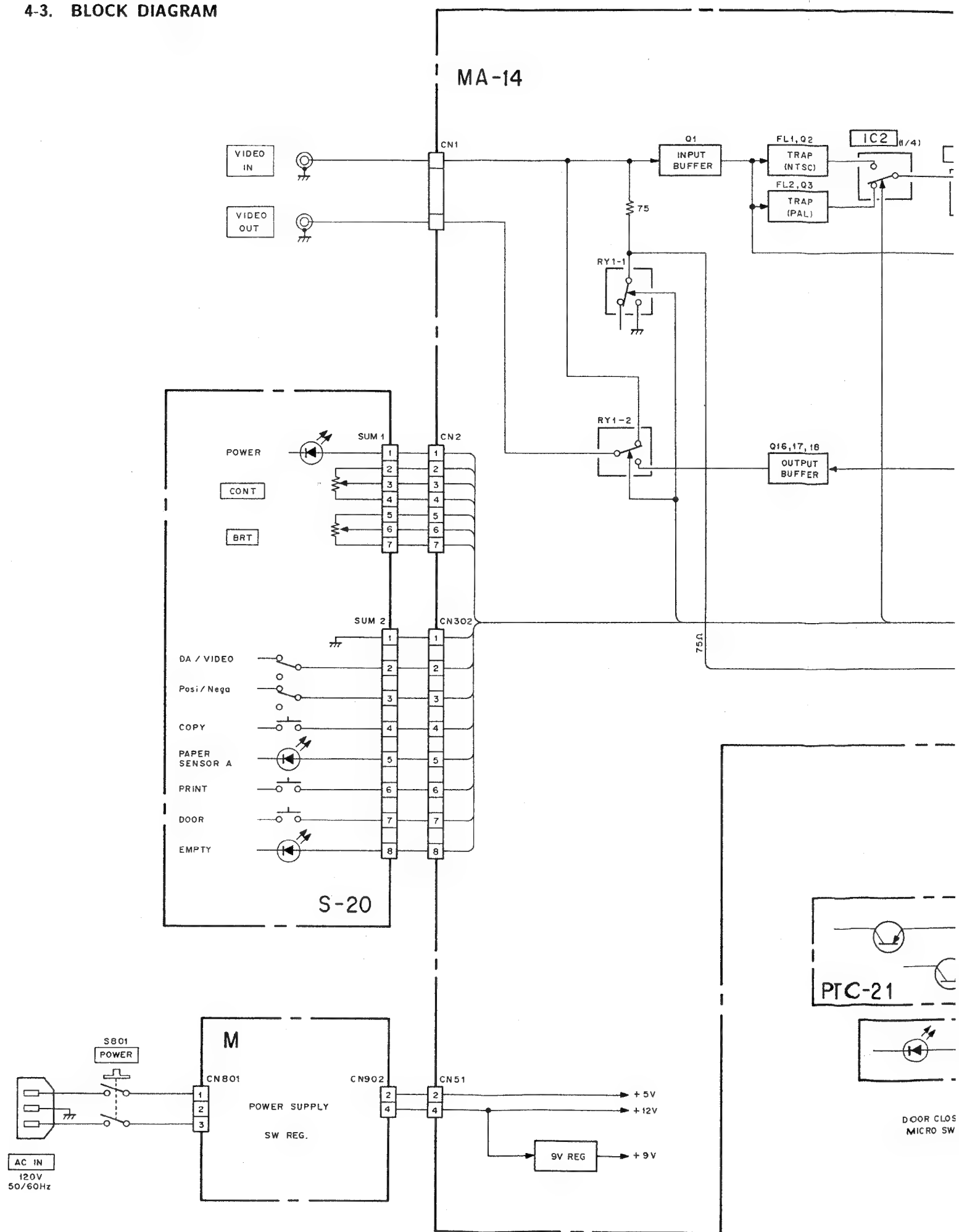
ERA85-009



4-2. CIRCUIT BOARDS LOCATION

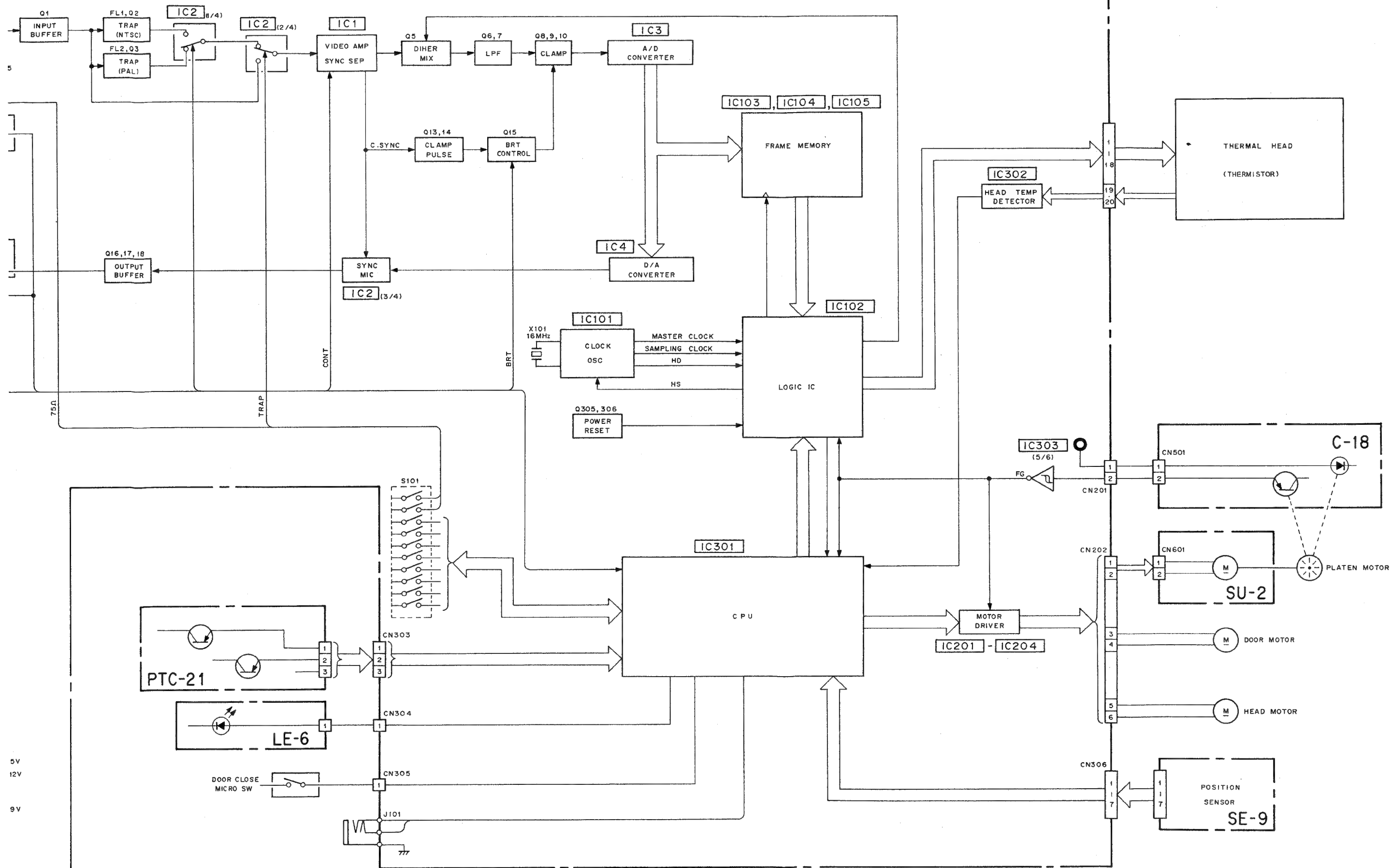


4-3. BLOCK DIAGRAM
















## 4.4. PRINTED WIRING BOARDS AND SCHEMATIC DIAGRAMS Refer to page 48 for waveforms



THIS NOTE IS COMMON FOR PRINTED WIRING BOARDS AND SCHEMATIC DIAGRAMS.  
(In addition to this, the necessary note is printed in each block.)

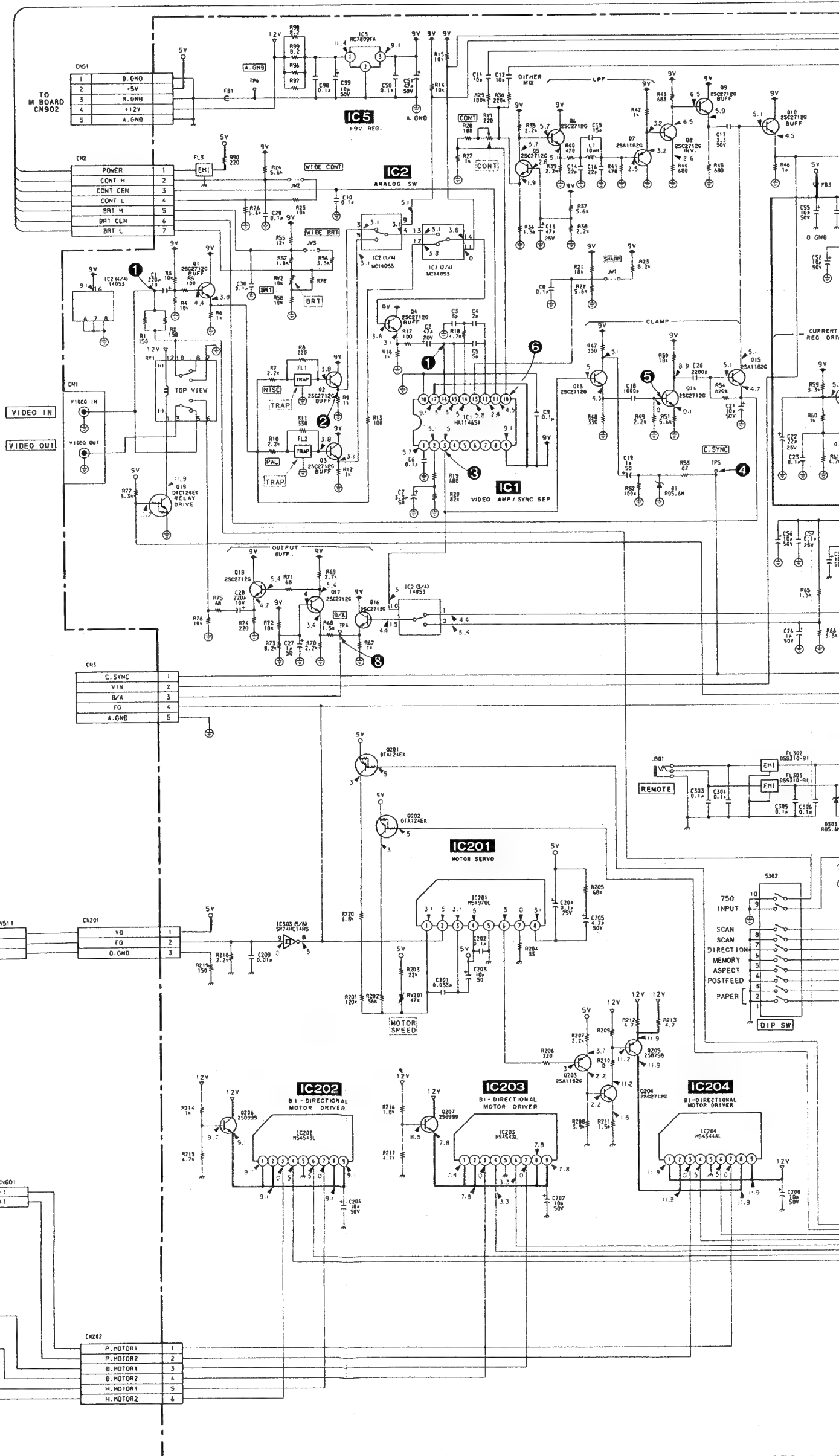
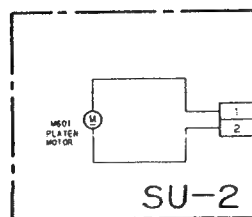
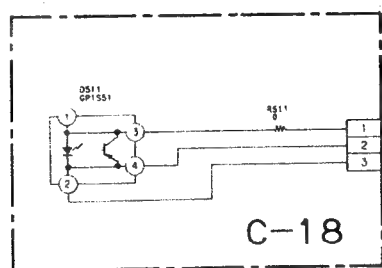
- For schematic diagrams.
- Caution when replacing chip parts.  
New parts must be attached after removal of chip.  
Be careful not to heat the minus side of tantalum capacitor, because it is damaged by the heat.
- All resistors are in ohms, 1/10W unless otherwise noted.  
k $\Omega$  : 1000 $\Omega$ , M $\Omega$  : 1000k $\Omega$ .
- All capacitors are in  $\mu$ F unless otherwise noted. pF:  $\mu$ F.  
50V or less are not indicated except for electrolytics and tantalums.
- All variable and adjustable resistors have characteristic curve B, unless otherwise noted.
-  : nonflammable resistor.
-  : fusible resistor.
-  : panel designation.
-  : adjustment for repair.
-  : B+ Line.
- Voltages are dc between ground and measurement points.
- Readings are taken with a color-bar signal playback.
- Readings are taken with a digital multimeter (DC10M $\Omega$ ).
- Voltage variations may be noted due to normal production tolerances.
- Circled numbers are waveform references

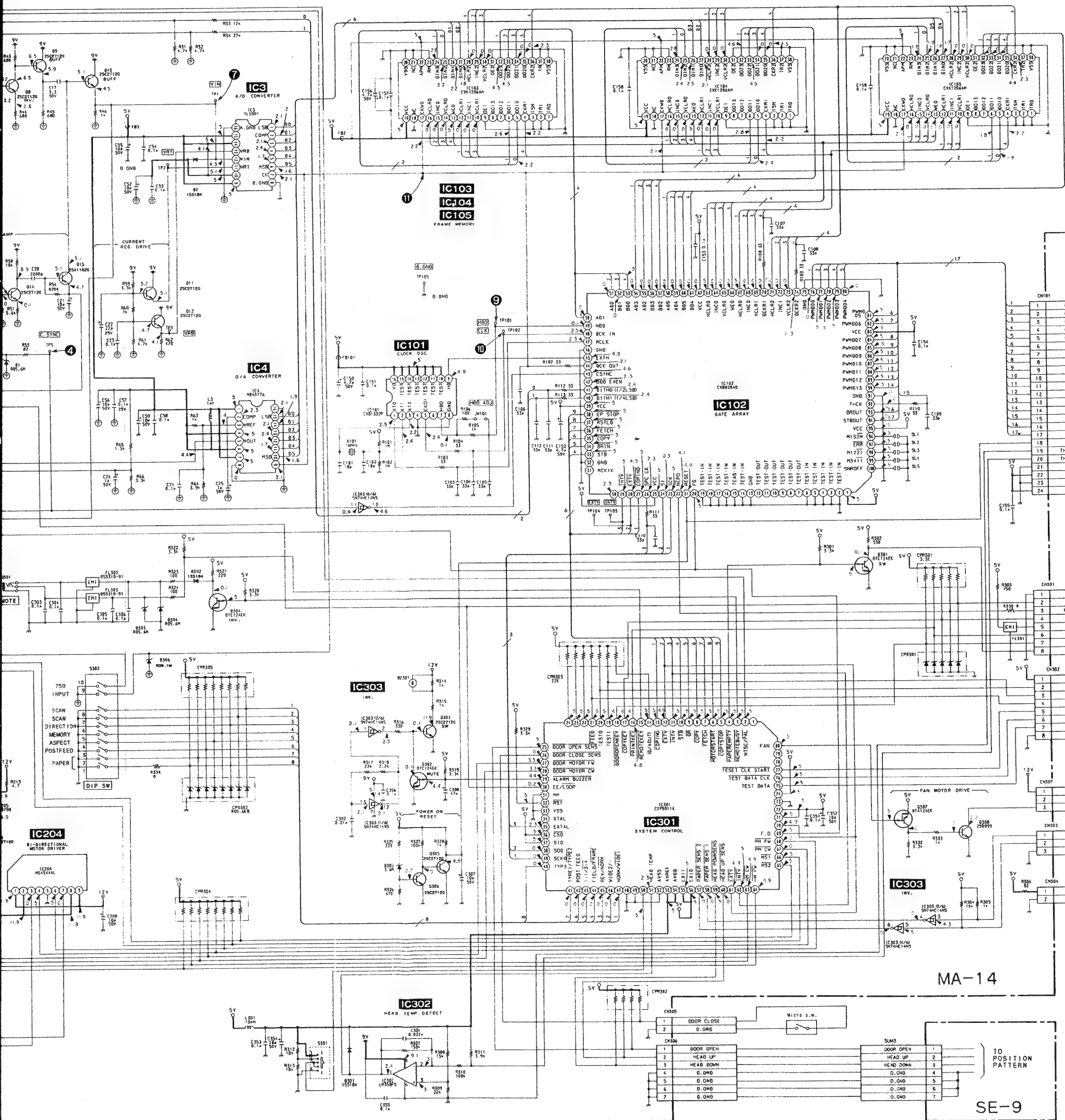
Note: The components identified by shading and mark  are critical for safety. Replace only with part number specified.

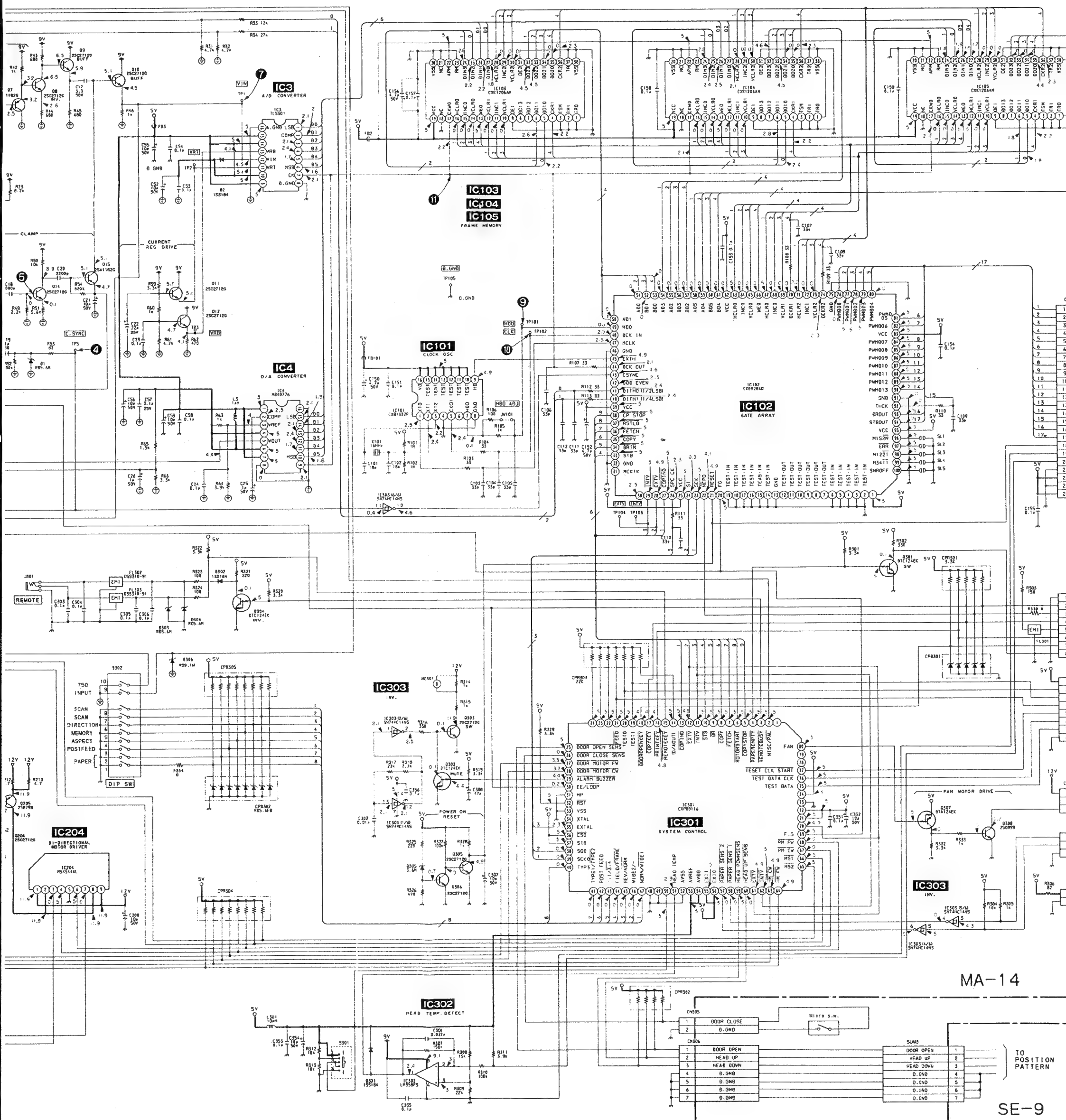
Note: Les composants identifiés par un trame et une marque  sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

For printed wiring boards.

-  : soldering side
-  : component side







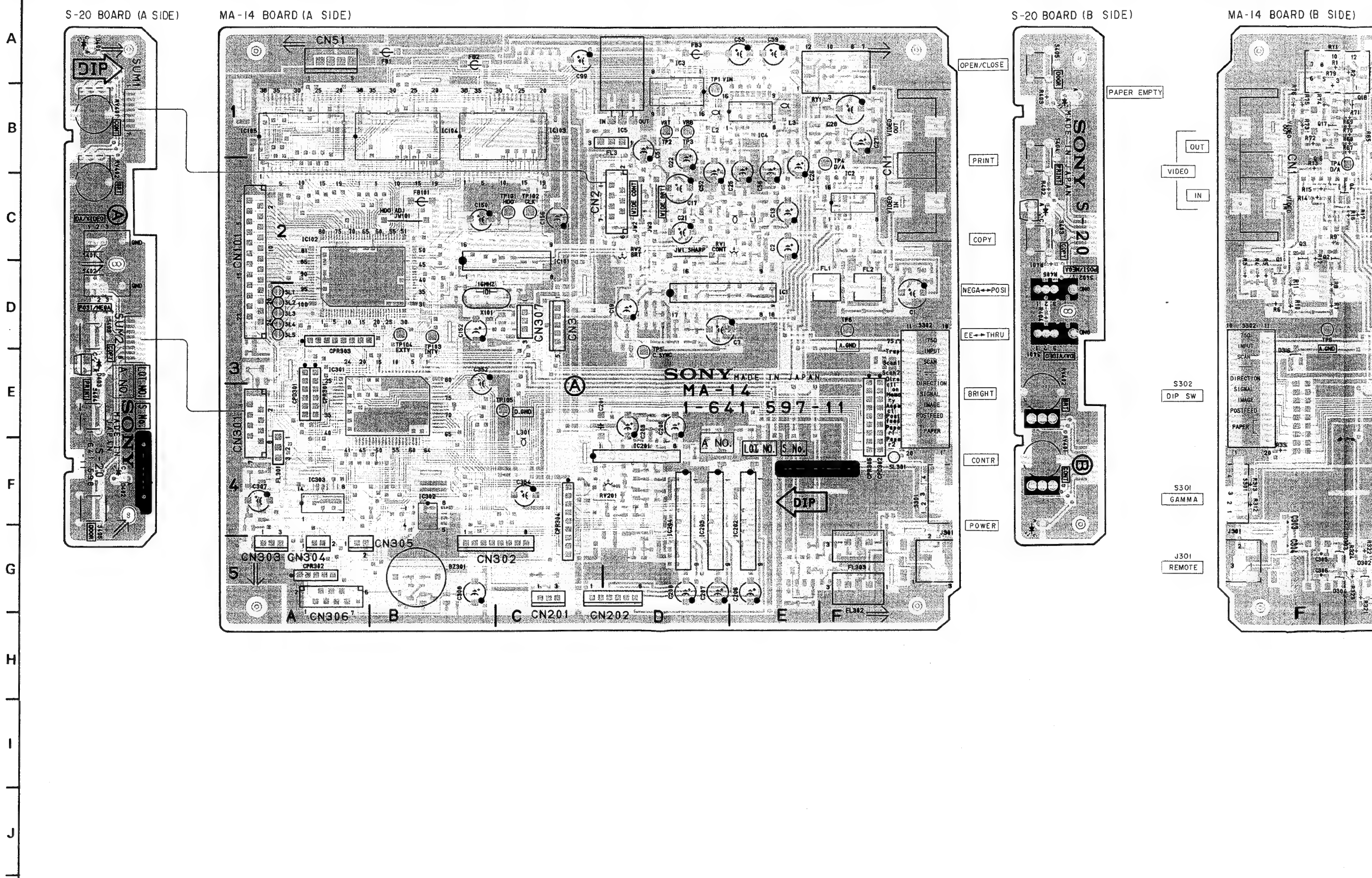
MA-14

SE-9

MAIN BLOCK  
MA-14

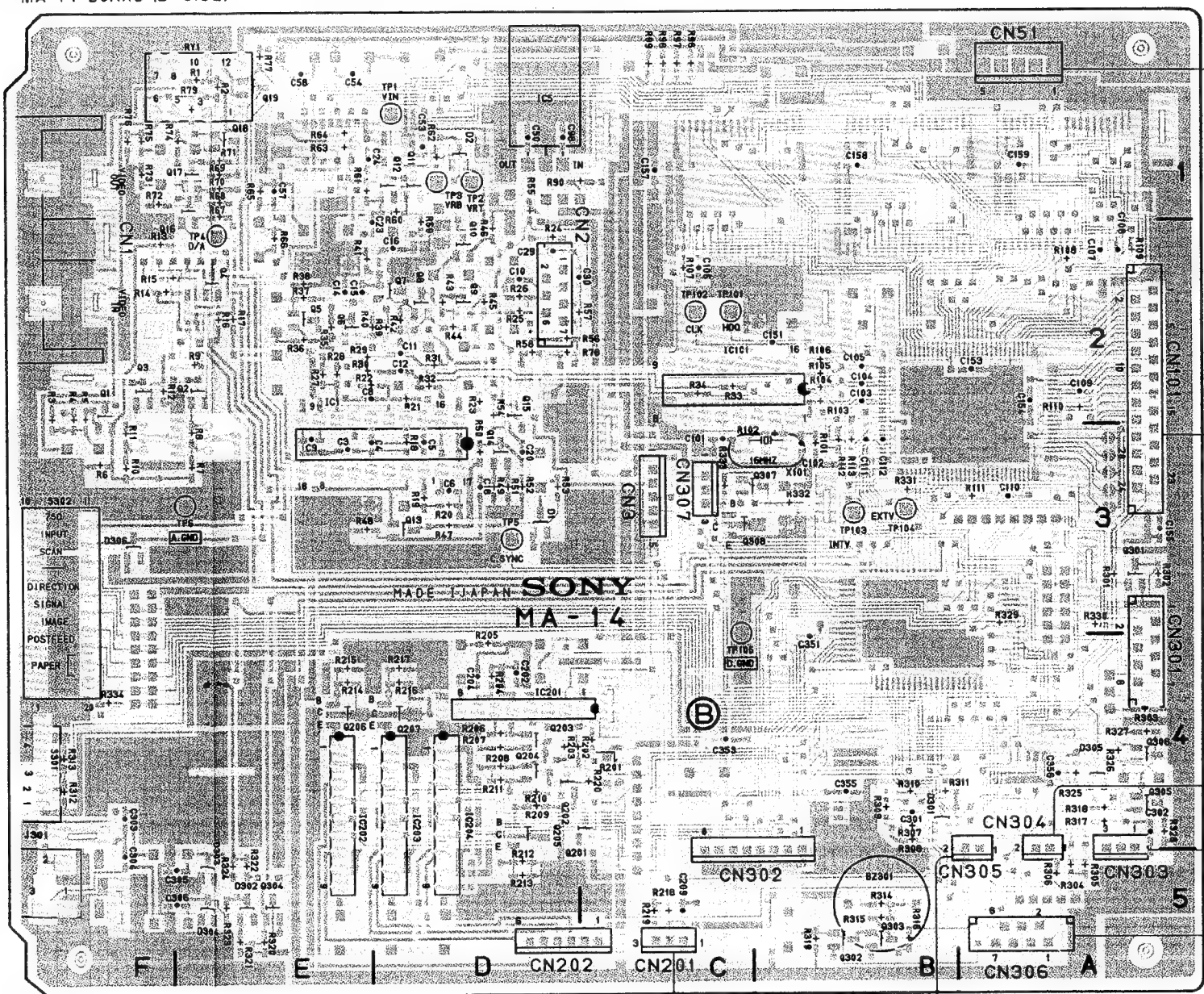






14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

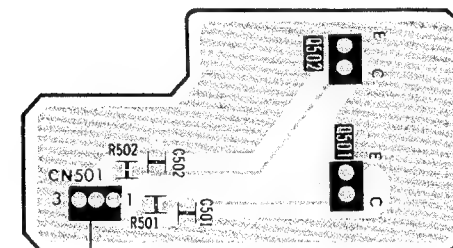
MA-14 BOARD (B SIDE)



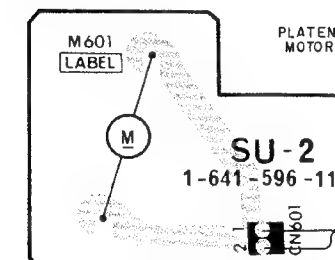
LE-6 BOARD



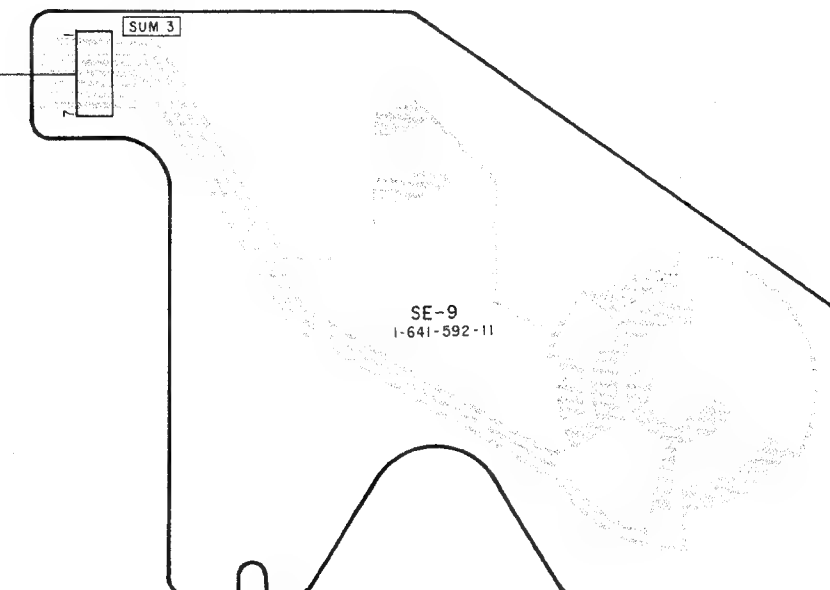
PTC-21 BOARD



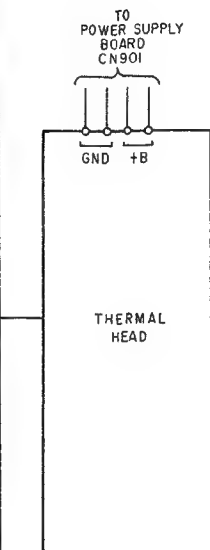
SU-2 BOARD



SE-9 BOARD

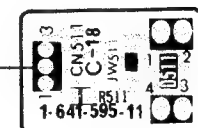


TO POWER SUPPLY BOARD  
CN902



THERMAL HEAD

C-18 BOARD



DOOR SW  
OPEN / CLOSE

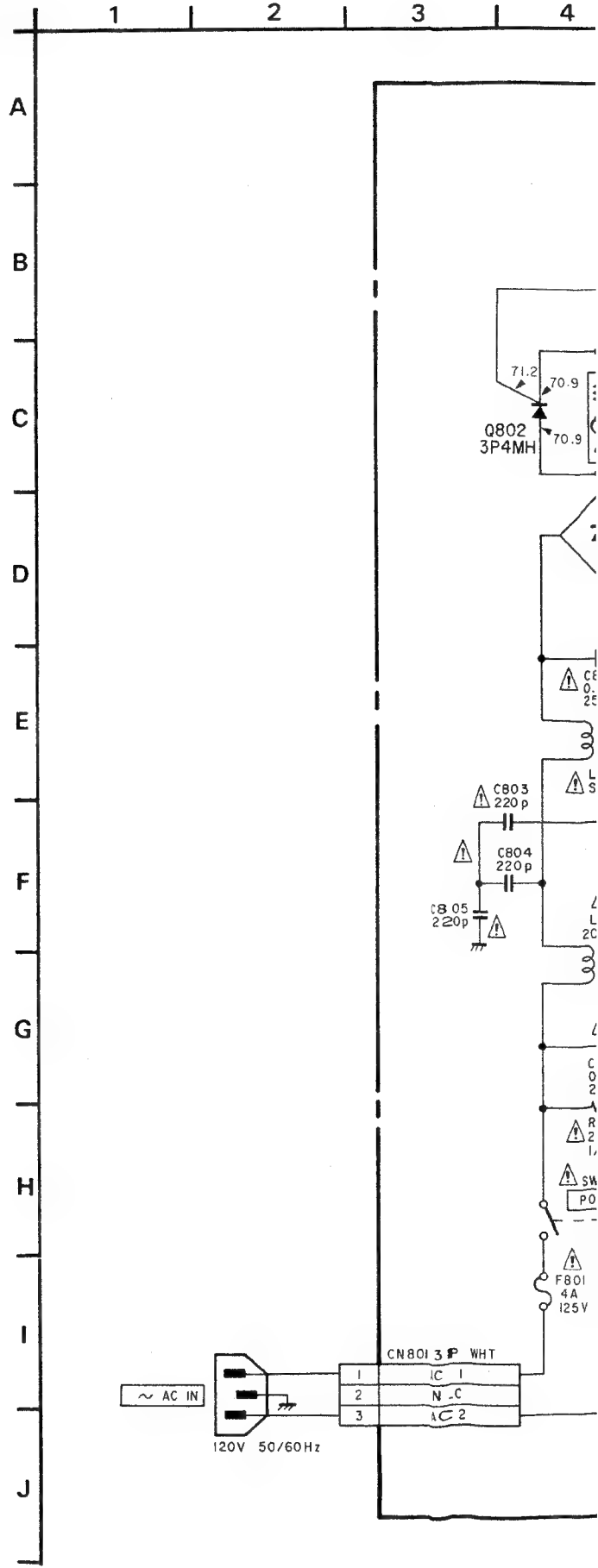
M952  
HEAD MOTOR

M951  
DOOR MOTOR

## UP-860/870MD

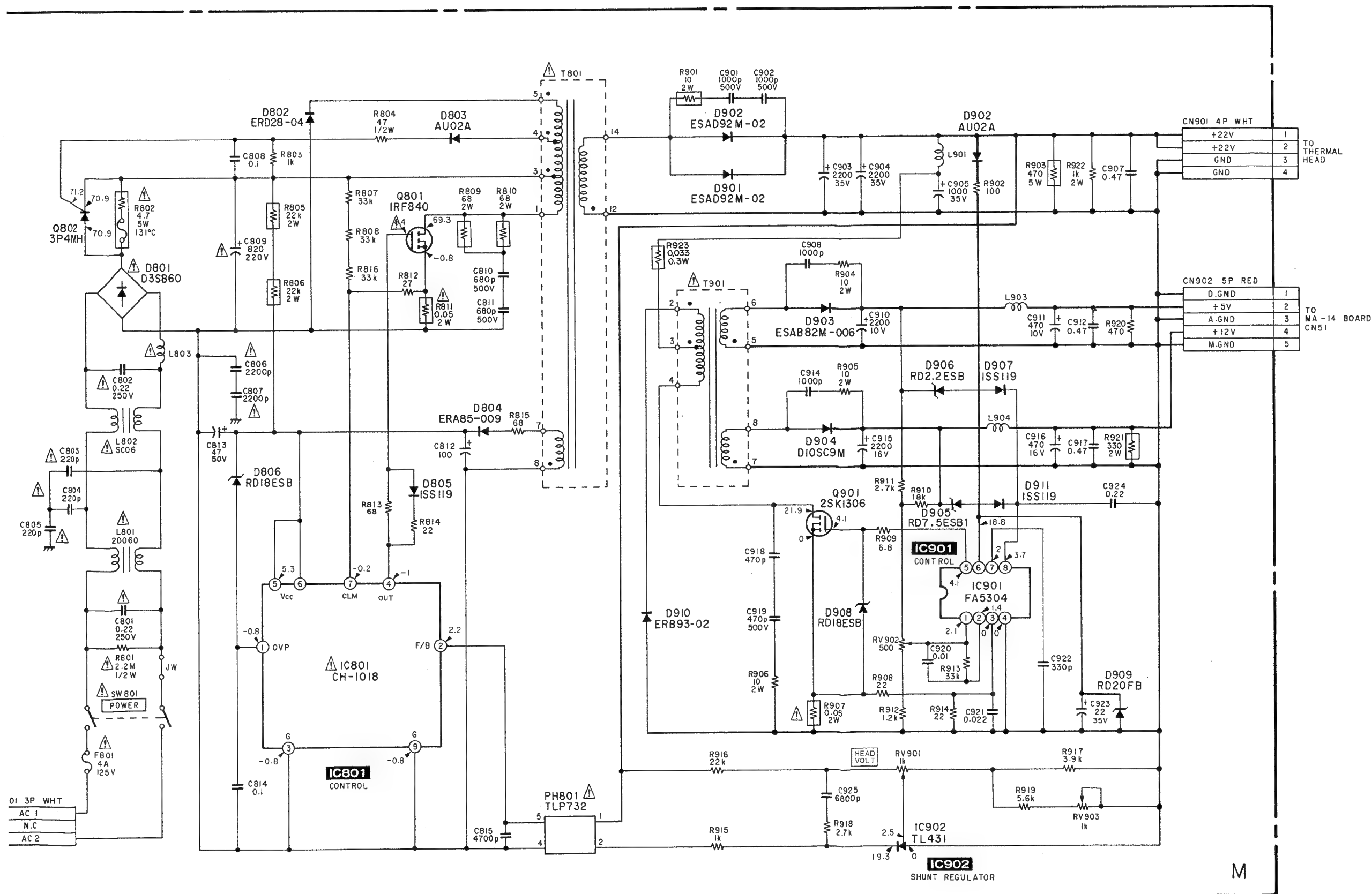
IC		D	
IC1	E-3	D1	D-3
IC2	F-2	D2	D-1
IC3	D-1	D301	B-4
IC4	E-1	D302	E-5
IC5	D-1	D303	E-5
IC101	C-2	D304	E-5
IC102	A-2	D305	A-4
IC103	C-1	D306	F-3
IC104	B-1		
IC105	A-1	ADJ	
IC201	D-4		
IC202	E-4	RV1	E-2
IC203	D-4	RV2	D-2
IC204	D-4	RV201	D-4
IC301	B-4		
IC302	B-4	TP	
IC303	A-4		
Q		TP1	D-1
		TP2	D-1
		TP3	D-1
Q1	F-2	TP4	F-2
Q2	E-2	TP5	D-3
Q3	F-2	TP6	F-3
Q4	E-2	TP101	C-2
Q5	E-2	TP102	C-2
Q6	E-2	TP103	B-3
Q7	D-2	TP104	B-3
Q8	D-2	TP105	C-4
Q9	D-2		
Q10	D-2		
Q11	D-1		
Q12	D-1		
Q13	D-3		
Q14	D-3		
Q15	D-2		
Q16	E-1		
Q17	E-1		
Q18	E-1		
Q201	D-4		
Q202	D-4		
Q203	D-4		
Q204	D-4		
Q205	D-4		
Q206	E-4		
Q207	D-4		
Q301	A-3		
Q302	B-5		
Q303	B-5		
Q304	E-5		
Q305	A-4		
Q306	A-4		
Q307	B-3		
Q308	C-3		

Less than 15891 (UP-860)
Less than 35201 (UP-870MD)



**POWER POWER**

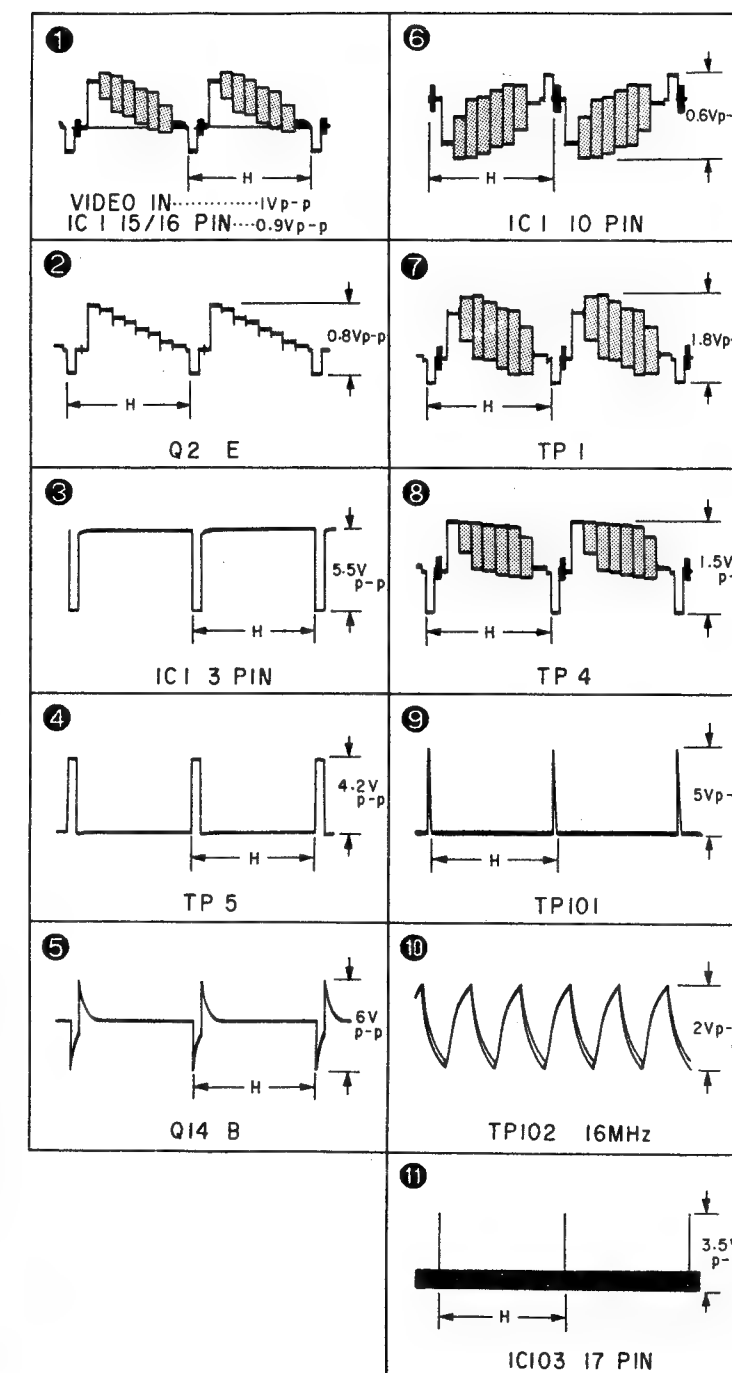
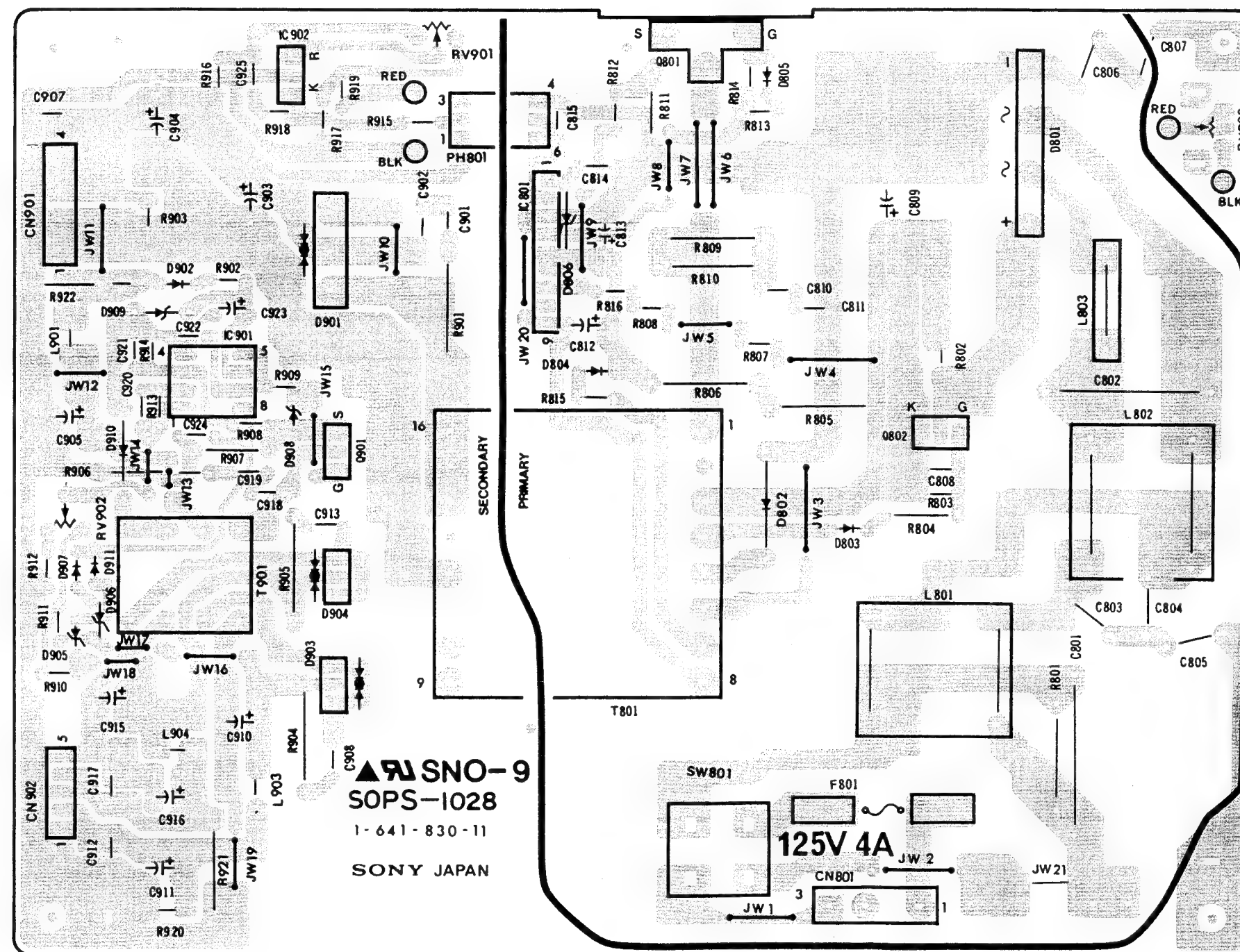




M (POWER SUPPLY)

Less than 15891 (UP-860)  
Less than 35201 (UP-870MD)

SOPS-1028 BOARD



## SECTION 5

### CIRCUIT DESCRIPTION

#### 5-1. VIDEO CIRCUIT

##### 5-1-1. Operation

A composite video signal is input from the BNC connector(CN1-(VIDEO-IN)) to the MA-14 board. The composite video signal is terminated with 75 ohms by R1 and R2 when the DIP switch (S302-⑩) is set to ON. The signal then passes through the input buffer and branches into three routes. Two of these three signals are input through trap circuit 1 (FL1 for NTSC signal) and trap circuit 2 (FL2 for PAL signal) to the analog switch (IC2-③⑤) and selected in accordance with the NTSC or PAL judgment of a microcomputer. The automatically selected signal and the signal supplied directly to the input buffer are input to the analog switch (IC2-⑫⑬). An original signal is selected when the DIP switch (S302-9) is set to ON. A luminance signal (Y signal) from which the color subcarrier signal has been extracted by the trap circuit is selected when it is set to OFF. The selected signal is input through the buffer to IC1-⑮⑯.

IC1-① extracts the C sync signal, ② emphasizes the picture, and ③ adjusts the contrast. The extracted C sync signal is output from IC1-③. The degree of the picture emphasis does not change because the value of the DC voltage input to IC1-⑬ is fixed. The signal gain is controlled by changing the DC voltage value at IC1-⑪ with the CONT control (RV401 on the S-20 board) on the front panel. The gain of the video signal output from IC1-⑩ is adjusted with RV1. The dither signal output from IC102-④⑪ is injected into the gain-adjusted signal. The signal is then band-limited using a low-pass filter and passed through the clamping circuit. The clamp level at that time is determined by RV2 and the BRT control (RV402 on the S-20 board) on the front panel.

The video signal is then input to the analog-digital converter (IC3-⑫) and converted into 6-bit digital data.

The sampling clock for the analog-digital converter is the 16 MHz clock output from IC102-④⑪. The converted digital data is sent to frame memory (IC103 through IC105) and digital-analog converter IC4 and reconverted into analog data. The resultant signal is output from IC4-⑤. Since this signal lacks a sync signal, the sync signal is injected by analog switch IC2. An original signal supplied directly to CN1-(VIDEO IN) is output from CN1-(VIDEO OUT).

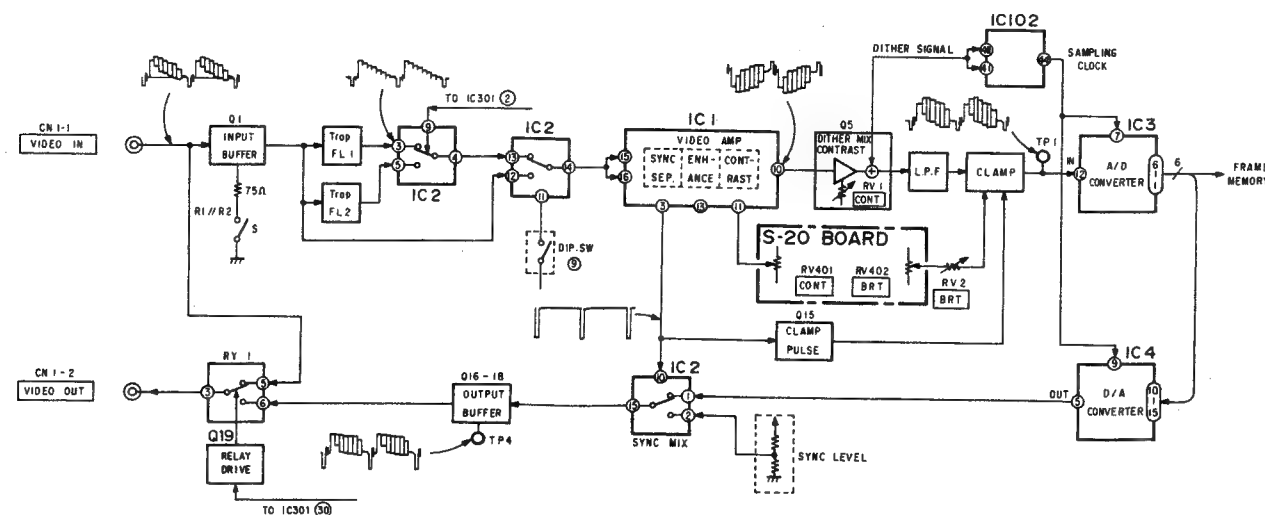


Fig.5-1. Video Signal Processing Section Block Diagram

#### 5-2. OSCILLATION CIRCUIT

An external crystal oscillator is connected to IC101, so the master clock is output from Pin ① and the sampling clock is output from Pin ⑤. Both these clocks are 16MHz, but the phase of the sampling clock is matched at the falling edge of the EXTH signal input to Pin ⑨. (See the figure below.)

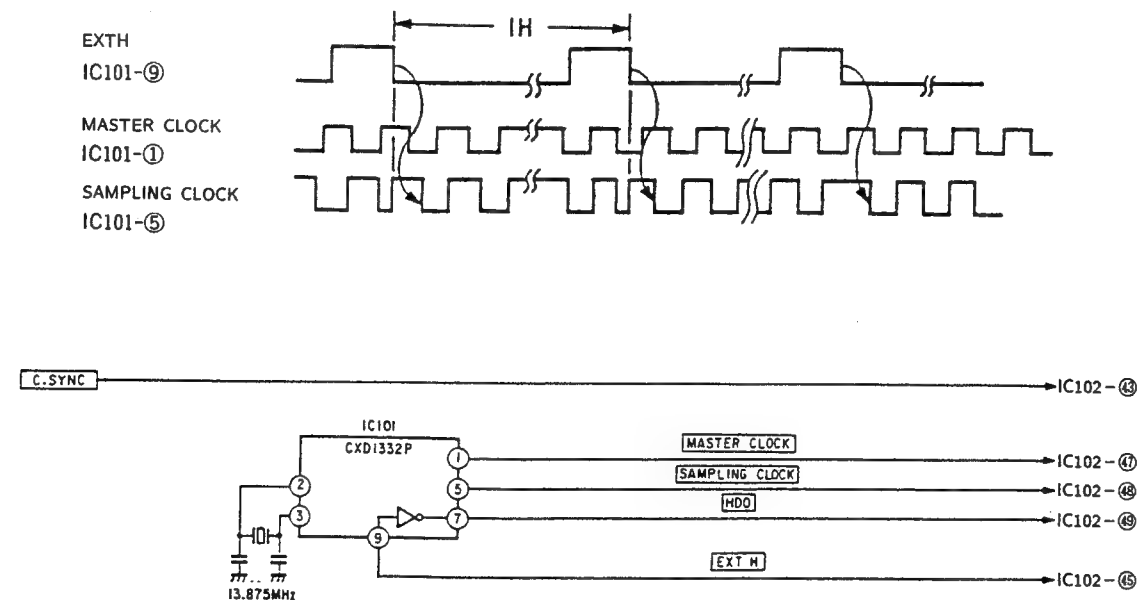


Fig.5-2 Clock Timing Chart and Circuit Diagram.

### 5-3. GATE ARRAY IC102 PERIPHERAL CIRCUITS

Gate array IC102 comprises the following blocks :

- (1) Registers for storing serial data from the CPU (for mode setting)
- (2) Frame memory write/read control
- (3) 1-line print timing generation
- (4) Thermal head control
- (5) Dither signal generation
- (6) Sync/signal processing
- (7) 1-line memory

The operation of each block is determined by the serial data from the CPU and the mode switch terminals.

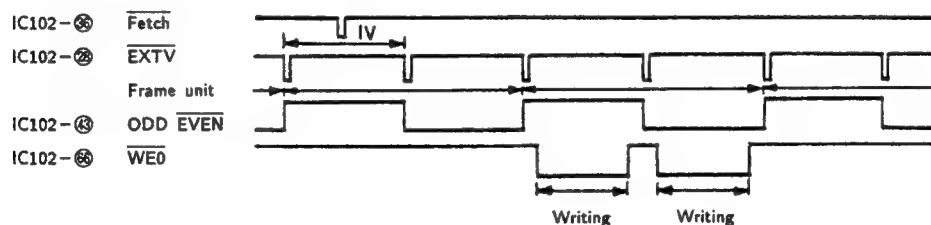
#### 5-3-1. Operations

##### 1. Mode setting

When the CPU has judged the states for DIP switch (S302), it sends 64-bit serial data to the shift register in gate array IC102. The data sets the modes for all the blocks in the gate array.

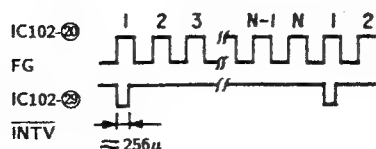
##### 2. Writing to the frame memory

When the Fetch pulse from the CPU is input to IC102-③⑤, the data for the next frame is written into the frame memory. The  $\overline{WE0}$  signal at IC102-⑥⑥ changes this way :



##### 3. Print timing generation

$\overline{INTV}$ , the timing pulse for printing one line is made by counting down the FG pulses for the DC servo motor. The count down number, N, is determined by the serial data from the CPU. Changing this value changes the print period and, since the motor speed is fixed, changes the print line pitch. In only the PAL 1:1 mode, the  $\overline{INTV}$  pulse is produced in realtime irrespective of the FG pulse. The time constant at that time is determined by the serial data from the CPU. IC102 watches the FG pulse and stops the  $\overline{INTV}$  pulse when the FG pulse stops for more than a fitted time period. In addition to the print timing, the  $\overline{INTV}$  pulse is used to detect the CPU motor speed. The CPU judges the motor speed from the  $\overline{INTV}$  pulse period and stops the motor if it detects any abnormality.



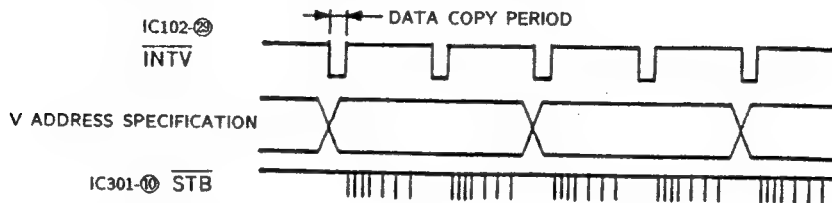
Count down number, N

Aspect	3:4	1:1
Signal		
NTSC	6	8
PAL	5	

#### 4. Copying from frame memory to 1-line memory

When the  $\overline{\text{COPY}}$  pulse is input to IC102 (8) from the CPU, the gate array sets  $\overline{\text{COPYING}}$  (IC102-27) "L" and enters printing mode.

In order to print it, the 1-line data selected from the frame memory, must be copied to the 1-line memory in gate array IC102. The frame memory comprises 2 fields, the odd field and the even field. When the gate array specifies the V direction address for the field memory, the data with the same V direction address is output from each field memory. Since the V direction address changes after every two lines of printing, in frame printing mode, 1-line memory is copied with the field memory selector in IC102 alternating between the ODD F1 and EVEN F1. The data is copied during the "L" period of each  $\overline{\text{INTV}}$  pulse.



#### 5. Reading out from 1-line memory

Data is read out from the 1-line memory while  $\overline{\text{INTV}}$  is "L". When the  $\overline{\text{STB}}$  pulse is input to IC102-33 from the CPU, the gate array starts to read from the 1-line memory. The read out data is input to the gate array and compared with the gradation counter. The result is converted from serial data to parallel data and sent to the thermal head. It is latched at the thermal head using the next  $\overline{\text{STB}}$  pulse. When the CPU issues the  $\overline{\text{DR}}$  signal, the thermal head turns on according to the latched data. This read-out operation is repeated 64 times while  $\overline{\text{INTV}}$  is high to complete the printing of one line.

#### 6. End of printing

The CPU specifies the print start V address and the print end V address with serial data. The V address is incremented or decremented in DIRECT mode. When gate array IC102 completes the specified range of printing, it returns  $\overline{\text{COPYING}}$  to "H" to tell the CPU that printing of one screen is complete.

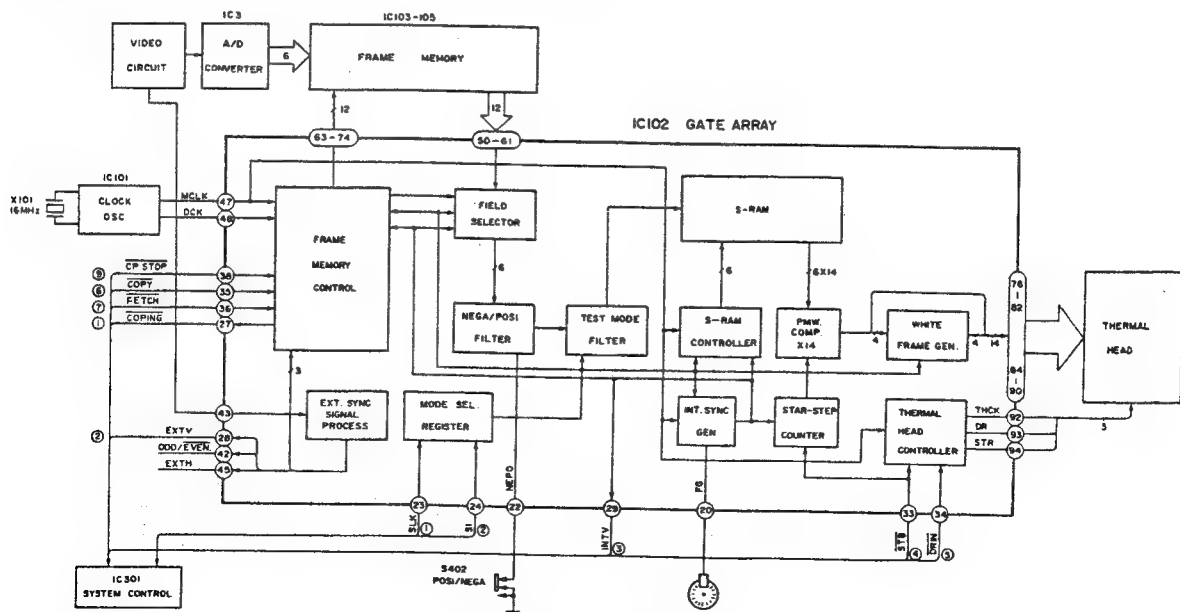


Fig. 5-3. Gate Array IC102 Peripheral Block Diagram

## 5-4. SYSTEM CONTROL SECTION

### PRINT preparations

- (i) Turn on the power and check that the POWER LED lights .
- (ii) Set paper in place, close the door, and check that the PAPER EMPTY LED goes off.
- (iii) Check that the Video signal (EIA or CCIR) is input to the VIDEO INPUT terminal.

\* Note 1: When the paper is set in place. IC301-⑤⑦ "L" This condition is met, IC301 switches off PAPER EMPTY-LED. (IC301-④)

\* Note 2: IC301-② is the reset terminal. When the power is first turned on, this pin is held low for a few msec, then set high to end the reset.

### 5-4-1. Memory write (FETCH) signals from the print key

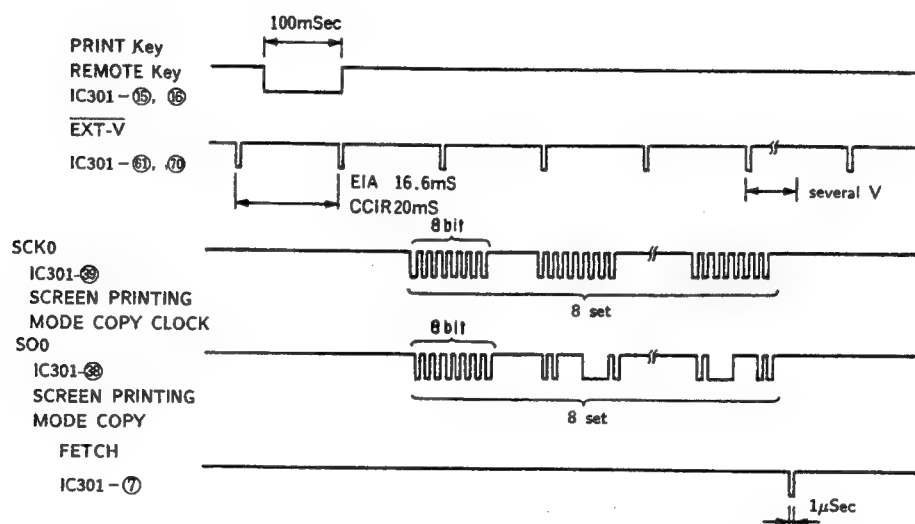


Fig. 5-4. Memory write timing chart

### Operation

- (i) When the PRINT key or REMOTE key signal is "L" for about 100 msec, the system enters PRINT MODE.
- (ii) When the system enters PRINT mode, first it verifies EXT-V, then it judges whether the format is EIA or CCIR.
- (iii) Once the video format has been judged, the screen print mode data for that format is transferred to IC102-②④, the SI (serial input) terminal, from the SO0 (serial output) terminal synchronized with the SCK0 (serial clock). This data is eight sets of 8 bits each for a total of 8 set (64 data) bits.
- (iv) A few EXT-V pulses after the data transfer is complete, the memory write timing signal (FETCH) is output. The timing is taken from IC102 and the video signal is recorded into the video memory, IC103 to 105.

### 5-4-2. From memory writing till screen printing

[ I ] From after memory writing till the  $\overline{\text{INT-V}}$  pulse measurement.

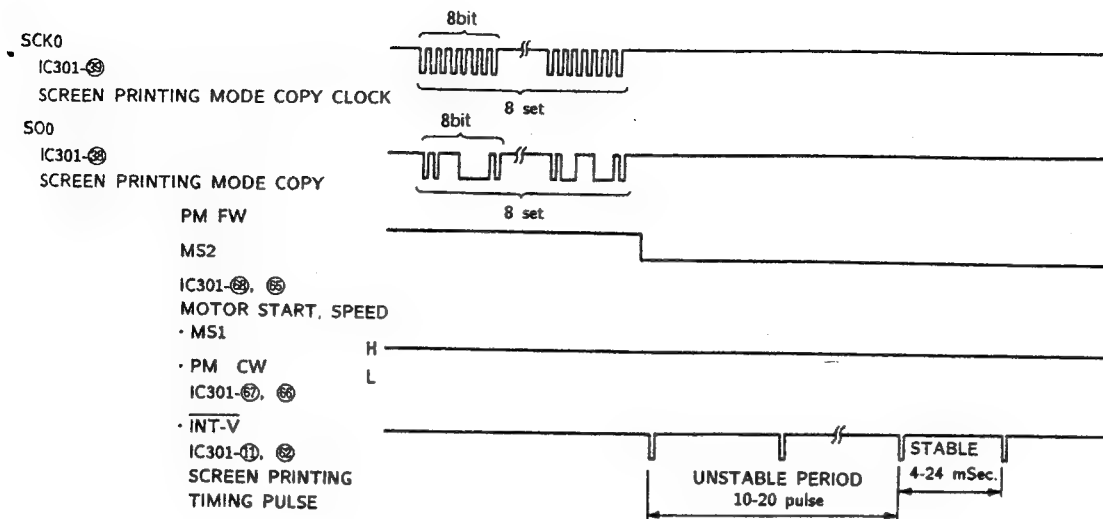


Fig. 5-5. Timing from memory writing till printing

#### Operation

The data input to the video memory (IC103 to 105) with the print key operation is printed with the following procedures:

\*Note 1: The copy key operation is triggered if the copy key is set "L" for at least 100 msec before this operation.

\*Note 2: This operation only occurs if a video signal is input to the video memory.

- (i) Turn the Head U/D motor (IC301-63, 64: "H", "L") and check that the Head goes down (IC301-65, 66: "L", "H"). Then stop the motor (IC301-63, 64: "H", "H"). When the post feed is ON, rewind the paper simultaneously. Turn the platen motor in reverse (IC301-67, 68: "L", "H") to return to the specified position, then stop the platen motor (IC301-67, 68: "H", "H").
- (ii) In order to specify the output format for the data from video memory, it is synchronized with the signal at the SCK0 terminal and the data is copied from the SO0 terminal to IC102-24 (SI terminal).
- (iii) When the data transfer is complete, the motor is rotated,  $\overline{\text{INT-V}}$  is generated from IC102-29, and input to IC301-11, 62. The operations of the PM FW (IC301-68), PM CW (IC301-67), MS1 (IC301-66), and MS2 (IC301-65) signals are as follows:

PM FW, PM CW . . . . . Turn  $\overline{\text{ON}}$ /OFF the platen motor  
(forward, reverse)  
MS1, MS2 . . . . . Switches HIGH/LOW of the platen motor  
speed, between 2 to 4 speed.

Here are the terminal states for each mode.

	PM FW	PM CW	MS1	MS2
STOP	H	H	H	H
3:4	L	H	H	L
1:1	L	H	L	H
Fast forward	L	H	L	H
Rewind	H	L	L	H

\* Note: Since  $\overline{\text{INT-V}}$  is made by counting down the FG frequency for the motor servo, if the motor is not turning, it is not output.

- (iv) When the platen motor is turning and the FG pulses are input to IC102-②③,  $\overline{\text{INT-V}}$  is output from IC102-②③, and input to IC301-①①, ⑥②. Within IC301,  $\overline{\text{INT-V}}$  is measured for about 10 to 20 pulses to ensure that  $\overline{\text{INT-V}}$  has a fixed pulse width. After verifying that the pulse period is 4 to 24 msec, the system moves to the next screen operation.

[ II ] From  $\overline{\text{INT-V}}$  pulse measurement to screen printing

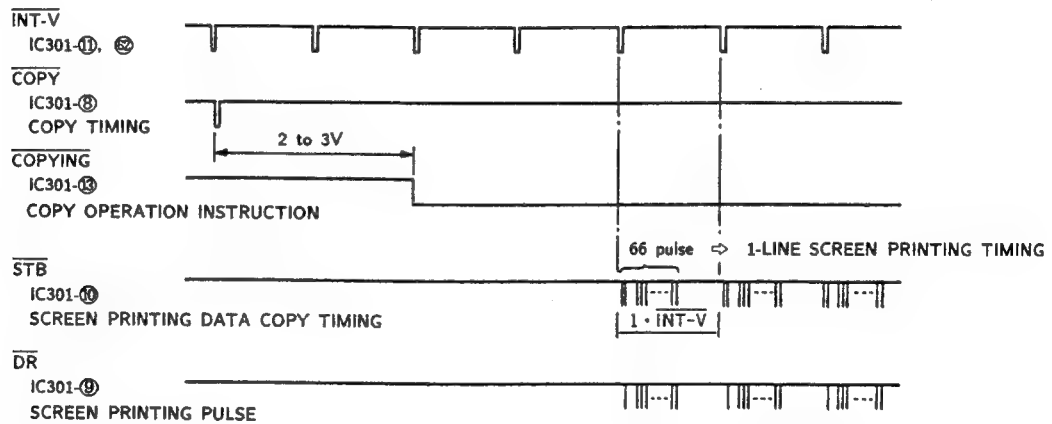


Fig.5-6. Screen Printing Timing

#### Operation

- When the platen motor rotation is stabilized and the  $\overline{\text{INT-V}}$  period is stable, the  $\overline{\text{COPY}}$  pulse is output to IC102-⑤ synchronized with  $\overline{\text{INT-V}}$ .
- When the  $\overline{\text{COPY}}$  pulse is input to IC102-⑤, IC102 outputs the  $\overline{\text{COPYING}}$  pulse from its pin ⑦ to IC301-⑬ to tell it that IC102 is standing by for screen printing.
- When IC301 verifies that  $\overline{\text{COPYING}}$  is "L", it outputs  $\overline{\text{STB}}$  and  $\overline{\text{DR}}$ . The screen printing timing is set by these signals.

\*Note: If the period of  $\overline{\text{INT-V}}$  fluctuates too greatly during screen printing, printing is stopped.



[III] To the end of screen printing and stopping

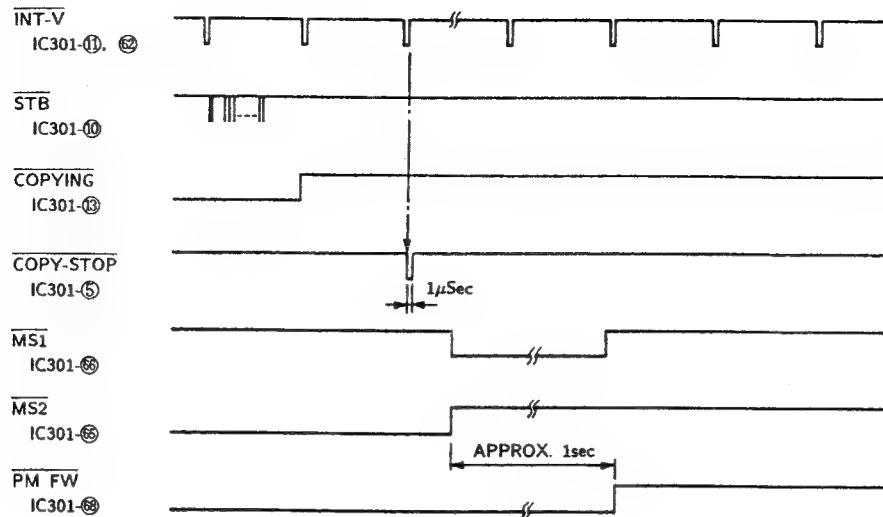


Fig.5-7. End of Screen Printing Timing

#### Operation

- (i) IC102 counts the printing lines and when the specified number of lines have been printed, it outputs a "H" signal from its IC102-27 to IC201-13, which tells IC301 that the printing operation has ended and it outputs the COPY-STOP pulse.

\*Note: The COPY-STOP pulse is also output even if COPYING is "L", if IC301 judges that something abnormal has arisen. In such a case, when this COPY-STOP pulse is input to IC102, it sets COPYING "H".

This characteristic can be used to analyze any problem that causes printing to stop. If COPY-STOP was issued while COPYING is "L", the cause is related to IC301 screen printint is then stopped. If COPY-STOP was issued while COPYING is "H", the cause is related to IC102.

- (ii) After the COPY-STOP pulse, MS1, MS2 are changed to fast forward for about 1 second, then PM FW is set "H" to stop.

Reverse the Head U/D motor (IC301-63, 64: "L", "H") and check that the Head goes up (IC301-69, 60: "H", "L"). Then stop the motor.  
(IC301-63, 64: "H", "H").

#### 5-4.3. Mode set

No.1 through 8 of DIP switch S302 on the rear panel are input to IC301 to select each screen printing mode. The mode set is input from IC301-33 to IC102-24 in serial data format when the PRINT key and COPY key are pressed.

Each screen printing mode cannot be selected during screen printing.

## 5-5. MOTOR DRIVE SECTION (IC201)

The platen motor, Head UP/down motor, and Door motor are driven with IC201, IC202, IC203, and IC209. They are all controlled by IC301.

### 5-5-1. Platen motor

The platen motor speed is controlled by IC201(M51970L). The frequency of the FG (optic read out) of the motor section is detected and fed back to IC201, which controls motor drive transistor Q205 to control the speed.

IC204 (M54544AL) can drive the motor in the forward or reverse direction.

The motor is turned ON/OFF and its speed controlled by IC301-~~65~~,~~66~~,~~67~~,~~68~~. (See the explanation of the system control section.)

Since this unit produces the  $\overline{\text{INT-V}}$  signal that provides the screen printing timing by dividing the FG frequency, even if there is some slight fluctuation in the FG frequency, the paper feed distance and printing quality are held constant.

### 5-5-2. Head U/D motor and DOOR motor

The Head U/D motor and DOOR motor are controlled by IC202 and 203 (both are M54543L). This IC can drive the motor in the forward or reverse direction, and it is controlled by IC301-~~27~~,~~28~~,~~29~~,~~30~~.

Head U/D motor

	IC301- <del>63</del>	IC301- <del>64</del>	Operation
DOWN	H	L	goes down the head
UP	L	H	goes up the head
STOP	H	H	locks to motor

Door motor

	IC301- <del>27</del>	IC301- <del>28</del>	Operation
OPEN	L	H	Opens the door
CLOSE	H	L	Closes the door

The above motor operation is controlled by detecting the condition of Head and Door with IC301 Pin~~25~~,~~26~~,~~29~~,~~30~~.

Head condition

	IC301- <del>29</del>	IC301- <del>30</del>	Condition
Top	L	L	Top position of the head to open the door.
Middle	H	L	Head is at this position except for <b>PRINT</b>
Bottom	L	H	Head is pressed against the platen.

Door condition

	IC301- <del>25</del>	IC301- <del>26</del>	Condition
Open	L	H	The door is opened.
Close	H	L	The door is closed.

## 5-6. THERMAL HEAD SECTION

The thermal head of this unit comprise 1-line of 896 dots ( $64 \text{ bits} \times 14$ ) and prints out the screen vertically.

### 5-6-1. Configuration

There are fourteen sets of the assemblies shown below. (The DATA inputs are DATA1 to 14. The other terminals are common.)

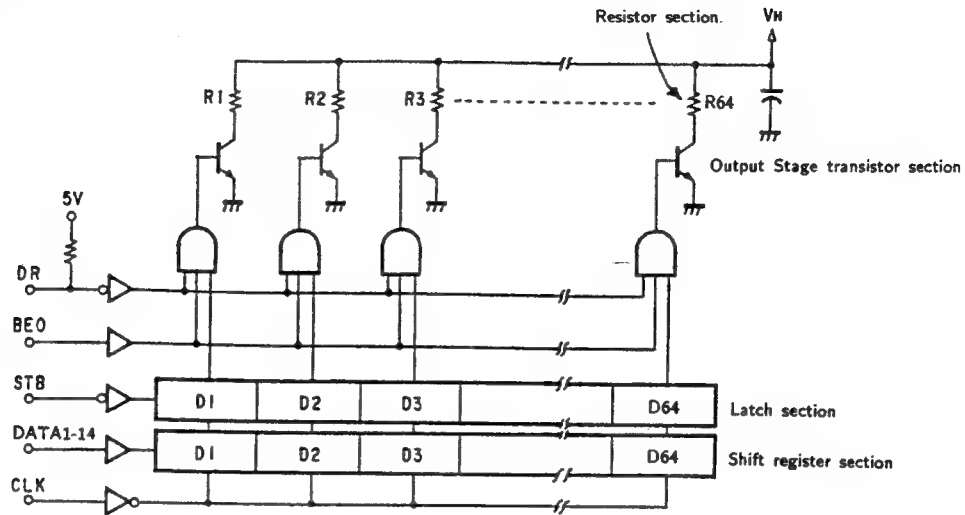


Fig.5-8. Head Internal Circuit Configuration

### 5-6-2. Timing Chart

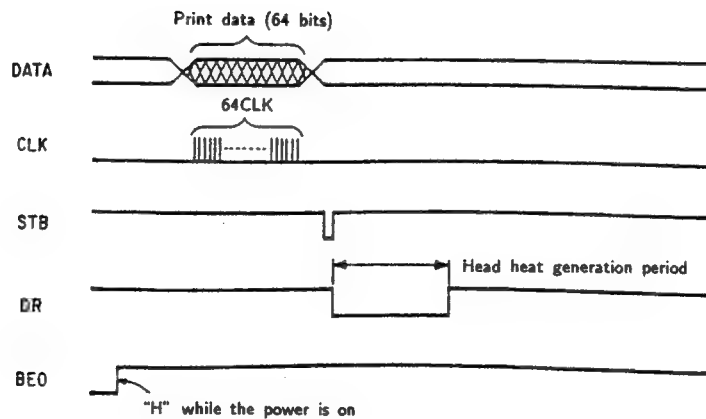


Fig.5-9. Timing Chart

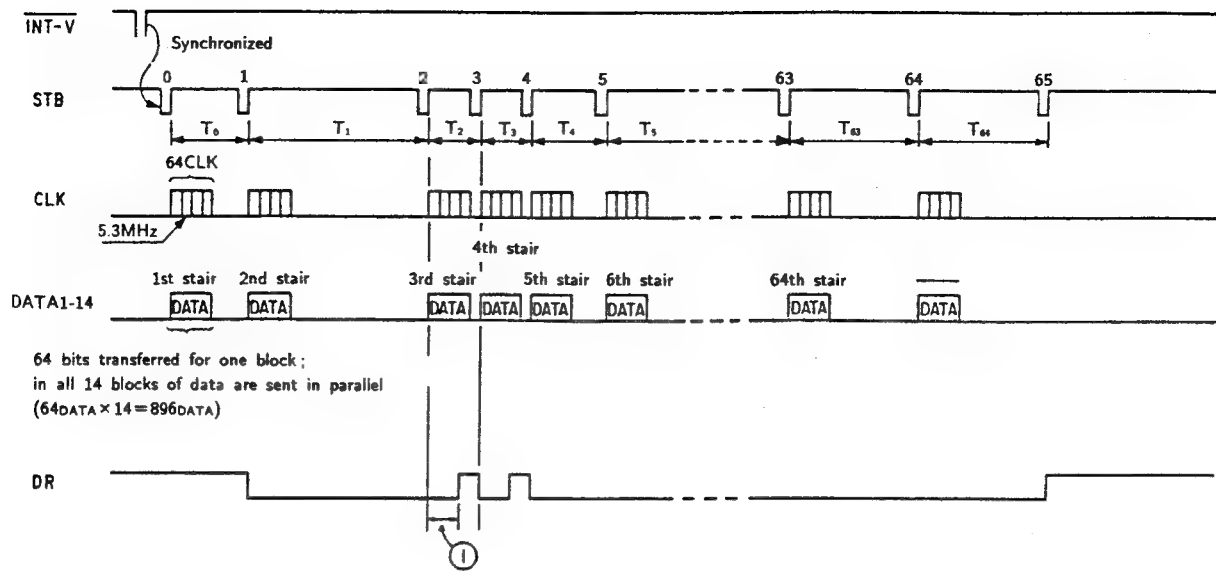


Fig.5-10. Stair Generation

### 5-6-3. Basic operation

All the signals are input to head from IC102. This section only explains the operations for one block. (The operations for the other blocks are the same.)

- (i) The 64 data items of screen printing are input to the shift register synchronized with CLK.
- (ii) When the STB pulse is input, the data input in (i) is moved from the shift register section to the latch section.
- (iii) When the DR pulse is input, the output stage transistors are switched ON/OFF by the "H" and "L" latch section data. While the transistors are on, the resistors heat up and thermosensitive paper changes color. The amount of heat generated is controlled by varying the length of the DR pulses, so the color darkness of the printing on thermosensitive paper can be varied.

\* Note: The BEO terminal goes from "L" to "H" only when the power is turned on. After that it stays "H".

### 5-6-4. Stair generation

As explained in the last section on basic operation, the darkness of the printing can be controlled with the DR pulses, but it is also possible to change the darkness by changing the high and low data input to the latch section. This section explains this method.

- (i) The data recorded in the video memory, IC103 to 105, in the print operation is input to the IC102 stair data generation circuit by 1H(1 line). [The stair data generation circuit outputs the 6 bits of data recorded in IC102 as one of 64 levels. If the 6-bit data is "3", then DATA "H" is sent to the head during the 1st, 2nd, and 3rd stairs of DATA 1 to 6 in Fig.5-10, but from the 4th stairs and later, the DATA "L" is sent.

In this way, the screen is printed with the third stair, but from the fourth stair and later is not printed. (See the explanation of the basic operations in 5-6-3.)

- (ii) The data is input to IC102, when the "0" STB pulse synchronized with INT-V is input, the first stair data is sent to the head shift register section synchronized with CLK.
  - (iii) When the "1" STB pulse is input, the 1st stair data is transferred to the latch section and the 2nd stair data is input to the shift register section. At the same time, the DR pulse goes "L" and the "H" data among the data input as the first stair data switches on the corresponding output stage transistors, heating up the corresponding resistors. The "L" data switches OFF the corresponding output stage transistors so those resistors do not heat up.  
This operation is carried out 64 times. If "H" data is sent the 1 through 64 times, the resistors generate heat the entire time and the printing is the blackest possible. If the data is only high until the 32 times, the printing is an intermediate stair. This is how intermediate stairs are generated by sending high data a certain number of times and generating heat in the resistors that many times.
  - (iv) Thus, by controlling the time until the next data is transferred to the latch, the darkness of intermediate stairs can be achieved simply. In other words, intermediate stair darkness can be controlled by changing the STB intervals,  $T_0$ ,  $T_1$ ,  $T_2$ ,  $T_3$ ,  $T_4$ ,  $\dots$ ,  $T_{63}$ ,  $T_{64}$ .  
Specifically, IC301 matches the intervals  $T_1$  to  $T_{64}$  to the paper's  $\gamma$  characteristic (the degree of darkening relative to the heat applied). This is called  $\gamma$  characteristic control.
  - (v) If the DR pulse is also controlled as described in 5-6-3, even fine stair can be expressed.
- \* Note: The section in ① is generated when the STB pulse T interval is  $26\mu\text{sec}$ .  
(The STB pulse T interval is a minimum of  $26\mu\text{sec}$ .)  
Thus, this unit provides smooth expression of intermediate stairs by controlling the STB pulse T interval and the DR pulses.

#### 5-6-5. Temperature compensation

As explained in 5-6-4, intermediate stairs are expressed by controlling the STB pulse T interval and the DR pulses, but since the energy required to make thermosensitive paper turn color varies with the room temperature and with the heat generated by and built up in the printing head during continuous printing.


This unit has a built-in thermistor (CN101-⑱, ⑳). IC301 measures the change in the head temperature and to compensate for temperature change controls the STB pulse T interval and the DR pulse, just as is done for stair generation. Specifically, when the temperature rises it reduces the STB pulse T interval and the DR pulses, but when the temperature falls, it increases the STB pulse T interval and the DR pulses.


## SECTION 6 EXPLODED VIEWS

### NOTE:

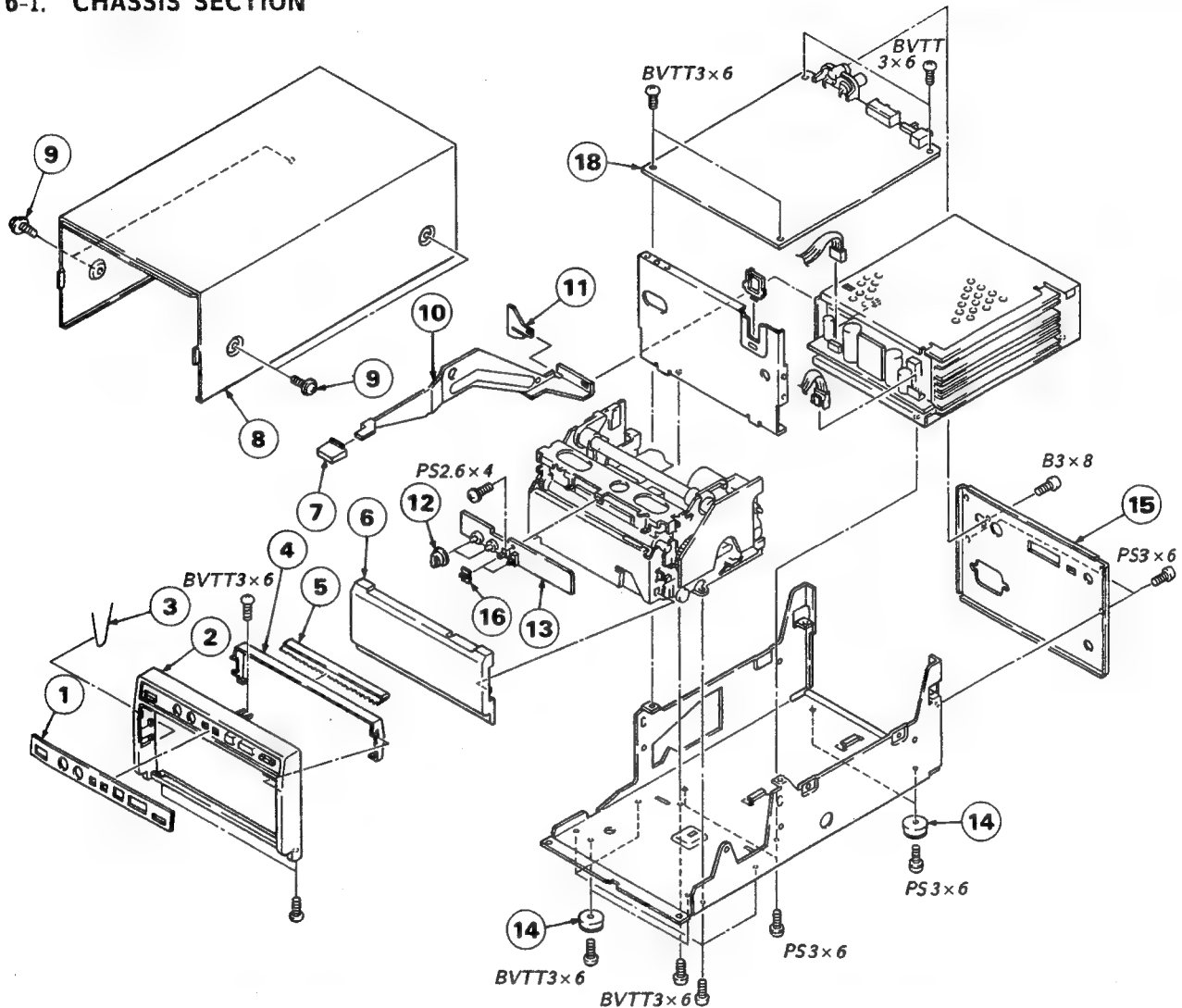
- Items with no part number and no description are not stocked because they are seldom required for routine service.
- The construction parts of an assembled part are indicated with a collation number in the remark column.

- Items marked " \* " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

The components identified by shading and mark  are critical for safety. Replace only with part number specified.

Les composants identifiés par une trame et une marque  sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

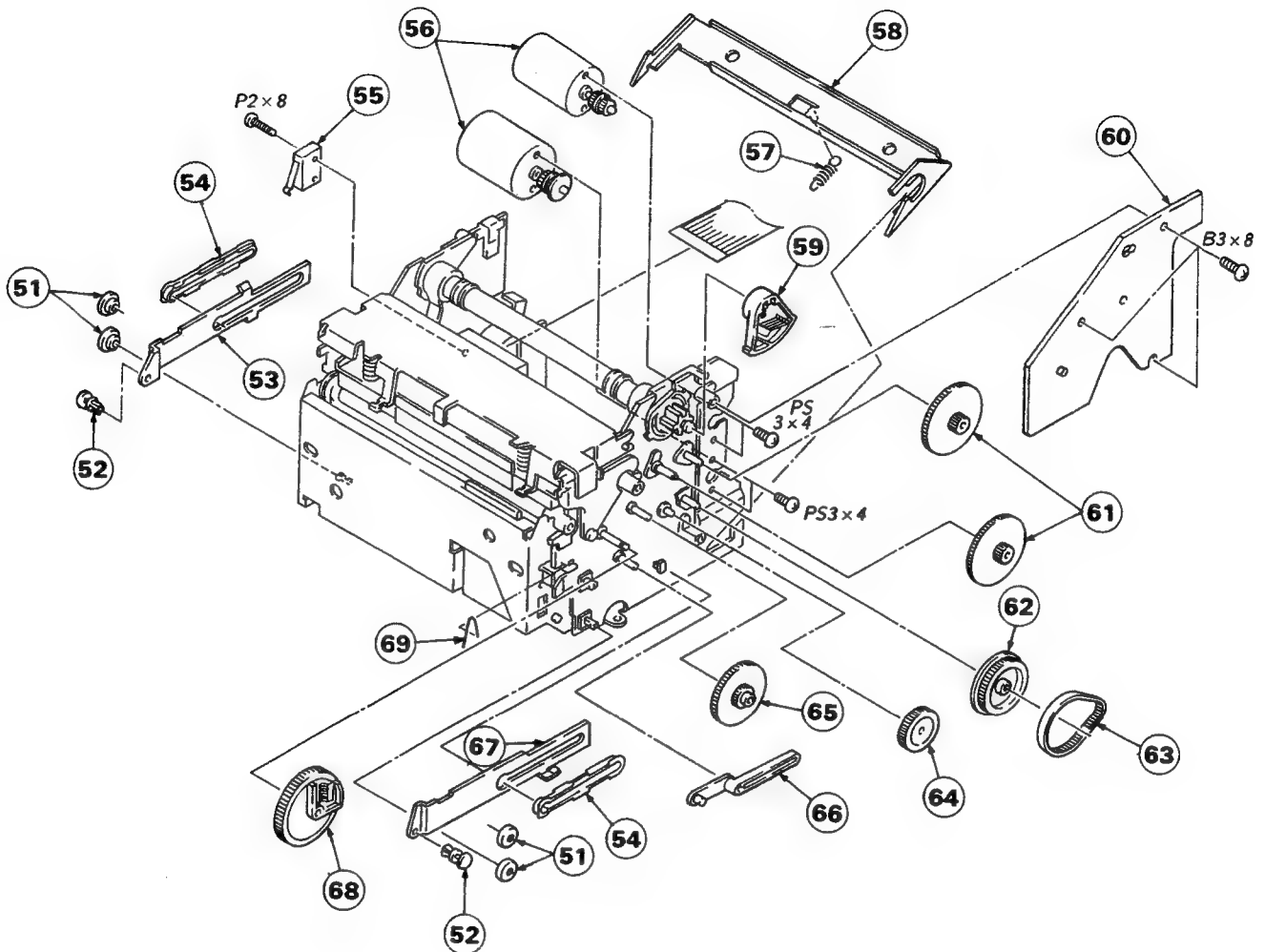
### 6-1. CHASSIS SECTION



Ref.No	Part No.	Description
1	3-173-617-01	SHEET, FRONT PANEL
2	3-173-924-01	PANEL, FRONT
3	3-173-604-01	SPRING, CUTTER
4	3-173-618-02	HOLDER, CUTTER
5	3-741-060-05	CUTTER
6	3-173-624-01	(860)PANEL, DOOR
6	3-173-624-11	(870MD)PANEL, DOOR
7	3-173-546-03	BUTTON, POWER
8	*3-173-622-02	COVER, TOP
9	4-886-821-11	SCREW, M3 CASE

Remark	Ref.No	Part No.	Description	Remark
	10	*3-173-923-03	ROD, POWER SWITCH	
	11	*3-173-922-01	STOPPER, ROD	
	12	3-173-544-01	KNOB, VOLUME	
	13	*1-641-598-11	S-20 BOARD	
	14	3-734-866-01	FOOT	
	15	*3-173-608-01	PANEL, REAR	
	16	3-173-545-01	KNOB, SLIDE SWITCH	
	17	*A-8271-107-A	MA-14 BOARD, COMPLETE	

## 6-2. PRINT MECHANISM SECTION (1)



Ref.No	Part No.	Description
--------	----------	-------------

51	3-741-065-01	ROLLER, SLIDE
52	3-531-576-11	RIVET
53	*3-173-554-01	RAIL (L)
54	3-173-558-01	GUIDE, RAIL
55	1-554-512-00	SWITCH, MICRO

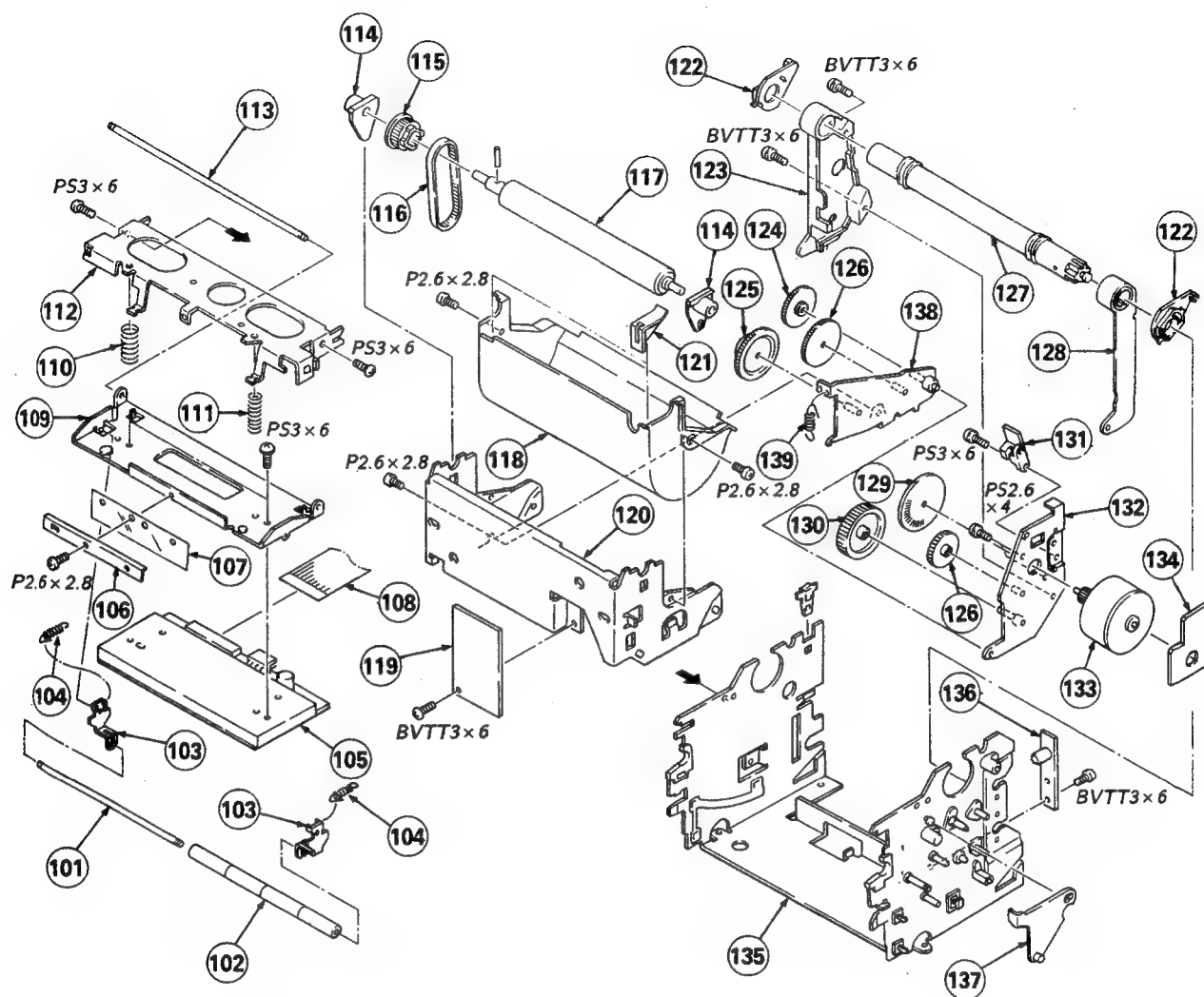
56	X-3166-427-1	GEAR MOTOR, S ASSY
57	3-173-559-01	SPRING (LOCK) TENSITON
58	*3-173-981-01	ARM, LOCK
59	X-3166-380-1	GEAR ASSY, DOOR

Remark
--------

Ref.No	Part No.	Description
60	*1-641-592-11	SE-9 BOARD
61	3-173-550-01	GEAR (D), IDLER
62	3-173-553-01	PULLEY (H), GEAR
63	3-173-560-01	BELT, 90TN
64	3-173-551-01	GEAR (S), IDLER
65	3-173-549-01	GEAR (H), IDLER
66	3-173-556-01	LINK, EJECT
67	*3-173-555-01	RAIL (R)
68	X-3166-379-1	GEAR ASSY, CAM
69	*3-173-548-01	SPRING, GROUND

Remark
--------

### 6-3. PRINT MECHANISM SECTION (2)

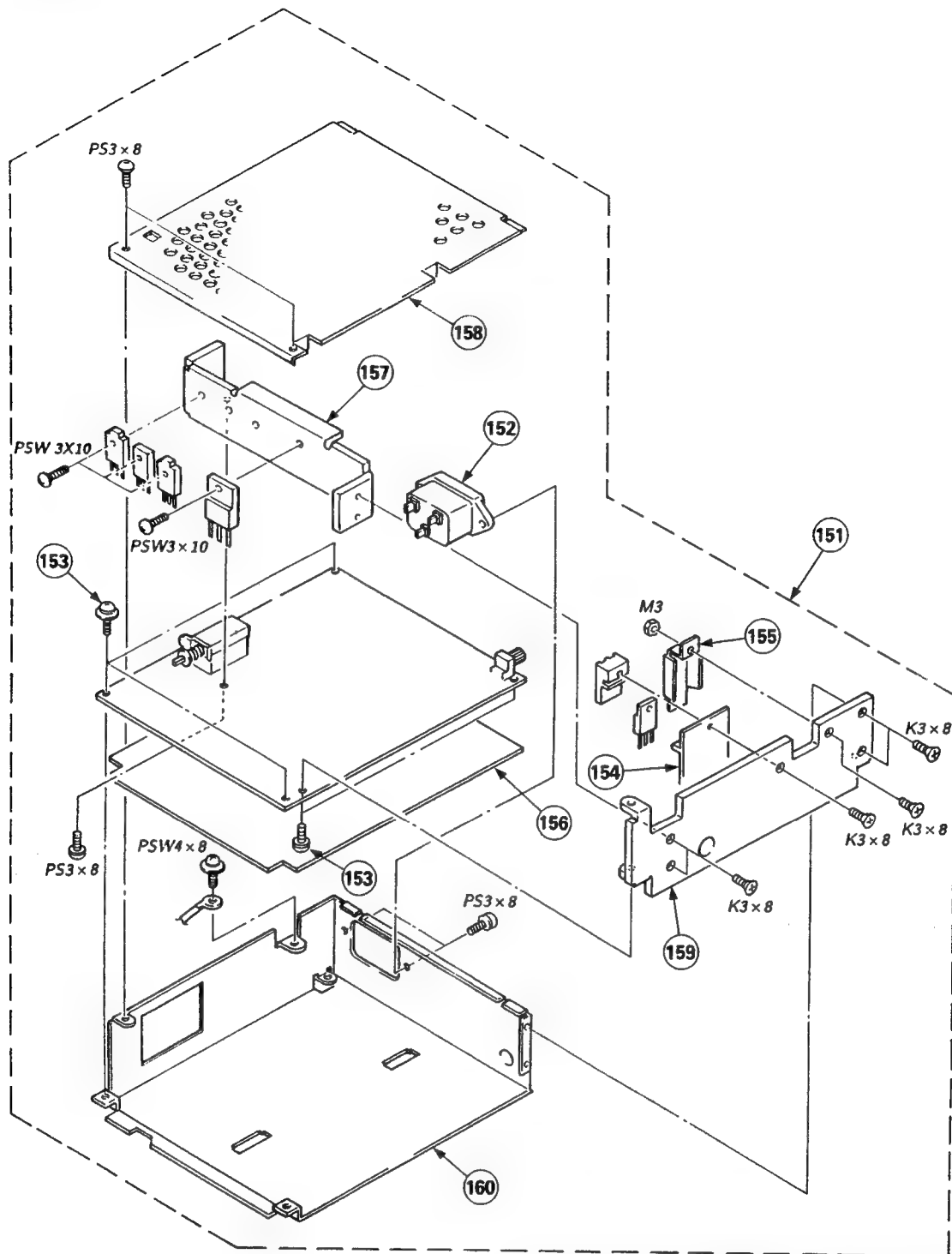


Ref. No	Part No.	Description	Remark
101	*3-173-562-01	SHAFT. PRESS	
102	3-745-319-01	ROLLER. PRESS	
103	*3-173-979-01	HOLDER. PRESS	
104	3-173-563-02	SPRING (PRESS). TENSION	
105	1-543-879-11	HEAD. THERMAL(KST-100-9MPL14-SN)	
106	*3-173-564-01	HOLDER. SHEET	
107	*3-174-266-01	SHEET. GUIDE	
108	1-690-503-11	WIRE. FLAT TYPE (24CORE)	
109	*3-173-980-01	HOLDER. HEAD	
110	3-173-978-01	SPRING (B). COMPRESSION	
111	3-173-977-01	SPRING (S). COMPRESSION	
112	*3-173-609-02	HOLDER. SPRING	
113	3-173-547-01	SHAFT. HEAD	
114	3-173-579-01	BEARING. PLATEN	
115	3-173-578-01	PULLEY. PLATEN	
116	3-174-267-01	BELT. 110TN	
117	3-173-615-01	PLATEN	
118	X-3166-429-1	TRAY. SLIDE ASSY (E)	
119	*1-641-593-11	PTC-21 BOARD	
120	*3-173-620-01	CHASSIS. INNER	

Ref. No	Part No.	Description	Remark
121	3-741-062-11	STAY. ROLL	
122	3-173-557-03	BEARING. ARM	
123	3-173-612-01	ARM (L)	
124	3-173-581-01	GEAR (G). IDLER	
125	3-173-616-02	PULLEY(P). GEAR	
126	3-173-566-01	GEAR (A)	
127	3-173-610-01	PIPE. ARM	
128	3-173-611-01	ARM (R)	
129	3-173-567-02	FIN. FG	
130	3-173-565-01	GEAR (M). IDLER	
131	*1-641-595-11	C-18 BOARD	
132	*X-3166-382-1	BRACKET ASSY. MOTOR	
133	X-3166-426-1	GEAR MOTOR M ASSY	
134	*1-641-596-11	SU-2 BOARD	
135	*X-3166-384-1	CHASSIS (OUTSRT) ASSY. MECH	
136	*1-641-594-11	LE-6 BOARD	
137	*X-3166-434-2	LINK ASSY. HEAD	
138	*X-3166-383-2	BRACKET ASSY. GEAR	
139	3-173-561-01	SPRING (BELT). TENSION	



## 6-4. POWER SUPPLY SECTION



The components identified by shading and mark **▲** are critical for safety. Replace only with part number specified.

Les composants identifiés par une trame et une marque **▲** sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Ref.No	Part No.	Description	Remark	Ref.No	Part No.	Description	Remark
151	▲ #1-413-694-13	SWITCHING REGULATOR (SOPS-1028)		156	▲ #2-625-757-01	SHEET, INSULATING A-1028	
152	▲ 1-580-375-11	INLET 3P		157	▲ #2-625-758-01	HEAT SINK B-1028	
153	2-430-772-00	SCREW M3X8		158	▲ #2-625-759-01	CASE B-1028	
154	▲ #2-431-514-11	RUBBER, INSULATING 1023		159	▲ #2-625-760-01	HEAT SINK A-1028	
155	▲ #2-625-756-01	SHEET, INSULATING B-1028		160	▲ #2-625-761-01	CASE A-1028	

# SECTION 7

## ELECTRICAL PARTS LIST

MA-14

## NOTE:

The components identified by shading and mark  $\Delta$  are critical for safety.  
Replace only with part number specified.

Les composants identifiés par une trame et une marque  $\Delta$  sont critiques pour la sécurité.  
Ne les remplacer que par une pièce portant le numéro spécifié.

• Items marked " \* " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

• All variable and adjustable resistors have characteristic curve B, unless otherwise noted.

## RESISTORS

• All resistors are in ohms  
• F : nonflammable

When indicating parts by reference number, please include the board name.

## CAPACITORS

• MF :  $\mu$ F, PF :  $\mu$ F

## COILS

• MMH : mH, UH :  $\mu$ H

Ref.No	Part No.	Description	Remark	Ref.No	Part No.	Description	Remark
	*A-8271-107-A	MA-14 BOARD, COMPLETE *****		C57	1-163-038-00	CERAMIC CHIP 0.1MF	25V
		<BUZZER>		C58	1-163-038-00	CERAMIC CHIP 0.1MF	25V
BZ301	1-529-080-11	BUZZER, PIEZOELECTRIC		C59	1-124-907-11	ELECT 10MF	20% 50V
		<CAPACITOR>		C98	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C1	1-126-176-11	ELECT 220MF	20% 10V	C99	1-124-907-11	ELECT 10MF	20% 50V
C2	1-124-477-11	ELECT 47MF	20% 25V	C101	1-163-099-00	CERAMIC CHIP 18PF	5% 50V
C3	1-163-086-00	CERAMIC CHIP 3PF	0.25PF 50V	C102	1-163-099-00	CERAMIC CHIP 18PF	5% 50V
C4	1-163-085-00	CERAMIC CHIP 2PF	0.25PF 50V	C103	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C5	1-163-088-00	CERAMIC CHIP 5PF	0.25PF 50V	C104	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C6	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C105	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C7	1-123-382-00	ELECT 3.3MF	20% 50V	C106	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C8	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C107	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C9	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C108	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C10	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C109	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C11	1-163-098-00	CERAMIC CHIP 10PF	5% 50V	C110	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C12	1-163-093-00	CERAMIC CHIP 10PF	5% 50V	C111	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C13	1-124-477-11	ELECT 47MF	20% 25V	C112	1-163-105-00	CERAMIC CHIP 33PF	5% 50V
C14	1-163-101-00	CERAMIC CHIP 22PF	5% 50V	C150	1-124-927-11	ELECT 4.7MF	20% 50V
C15	1-163-097-00	CERAMIC CHIP 15PF	5% 50V	C151	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C16	1-163-101-00	CERAMIC CHIP 22PF	5% 50V	C152	1-124-927-11	ELECT 4.7MF	20% 50V
C17	1-123-382-00	ELECT 3.3MF	20% 50V	C153	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C18	1-163-141-00	CERAMIC CHIP 0.001MF	5% 50V	C154	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C19	1-124-903-11	ELECT 1MF	20% 50V	C155	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C20	1-164-161-11	CERAMIC CHIP 2200PF	5% 50V	C156	1-124-927-11	ELECT 4.7MF	20% 50V
C21	1-124-907-11	ELECT 10MF	20% 50V	C157	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C22	1-126-233-11	ELECT 22MF	20% 25V	C158	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C23	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C159	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C24	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C201	1-130-489-00	MYLAR 0.033MF	5% 50V
C25	1-124-903-11	ELECT 1MF	20% 50V	C202	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C26	1-124-903-11	ELECT 1MF	20% 50V	C203	1-124-907-11	ELECT 10MF	20% 50V
C27	1-124-903-11	ELECT 1MF	20% 50V	C204	1-164-004-11	CERAMIC CHIP 0.1MF	10% 25V
C28	1-126-176-11	ELECT 220MF	20% 10V	C205	1-124-927-11	ELECT 4.7MF	20% 50V
C29	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C206	1-124-907-11	ELECT 10MF	20% 50V
C30	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C207	1-124-907-11	ELECT 10MF	20% 50V
C50	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C208	1-124-907-11	ELECT 10MF	20% 50V
C51	1-124-477-11	ELECT 47MF	20% 25V	C209	1-163-031-91	CERAMIC CHIP 0.01MF	50V
C52	1-124-907-11	ELECT 10MF	20% 50V	C301	1-163-033-00	CERAMIC CHIP 0.022MF	50V
C53	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C302	1-163-031-91	CERAMIC CHIP 0.01MF	50V
C54	1-163-038-00	CERAMIC CHIP 0.1MF	25V	C303	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C55	1-124-907-11	ELECT 10MF	20% 50V	C304	1-163-038-00	CERAMIC CHIP 0.1MF	25V
C56	1-124-907-11	ELECT 10MF	20% 50V	C305	1-163-038-00	CERAMIC CHIP 0.1MF	25V
				C306	1-163-038-00	CERAMIC CHIP 0.1MF	25V
				C307	1-124-907-11	ELECT 10MF	20% 50V
				C308	1-124-477-11	ELECT 47MF	20% 25V

# MA-14

Ref.No	Part No.	Description	Remark	Ref.No	Part No.	Description	Remark
C351	1-163-038-00	CERAMIC CHIP 0.1MF	25V	IC5	8-759-982-10	IC RC7809FA	
C352	1-124-907-11	ELECT 10MF	20%	IC101	8-759-140-94	IC CXD1332P	
C353	1-163-038-00	CERAMIC CHIP 0.1MF	25V	IC102	8-759-164-88	IC CXD8284AQ	
C354	1-124-907-11	ELECT 10MF	20%	IC103	8-752-337-41	IC CXK1206M	
C355	1-163-038-00	CERAMIC CHIP 0.1MF	25V	IC104	8-752-337-41	IC CXK1206M	
C356	1-163-038-00	CERAMIC CHIP 0.1MF	25V	IC105	8-752-337-41	IC CXK1206M	
<CONNECTOR>				IC201	8-759-051-52	IC M51970L	
CN1	1-691-431-11	CONNECTOR. BNC		IC202	8-759-600-24	IC M54543L	
CN2	1-691-461-11	SOCKET. CONNECTOR 7P		IC203	8-759-600-24	IC M54543L	
CN3	1-506-470-11	PIN. CONNECTOR 5P		IC204	8-759-633-10	IC M54544AL	
CN51	*1-560-893-00	PIN. CONNECTOR 5P		IC301	8-752-839-14	IC CXP80P116Q-2-221	
CN101	*1-563-864-21	SOCKET. CONNECTOR 24P		IC302	8-759-983-69	IC LM358PS	
CN201	1-506-468-11	PIN. CONNECTOR 3P		IC303	8-759-925-80	IC SN74HC14NS	
CN202	*1-568-955-11	PIN. CONNECTOR 6P		<JACK>			
CN301	1-691-417-11	SOCKET. CONNECTOR 8P		J301	1-507-967-11	JACK	
CN302	1-506-473-11	PIN. CONNECTOR 8P		<INDUCTOR>			
CN303	*1-506-468-11	PIN. CONNECTOR 3P		L1	1-408-777-00	INDUCTOR CHIP 10UH	
CN304	*1-568-951-11	PIN. CONNECTOR 2P		L2	1-408-765-21	INDUCTOR CHIP 1UH	
CN305	*1-568-951-91	PIN. CONNECTOR (STRAIGHT) 2P		L3	1-408-765-21	INDUCTOR CHIP 1UH	
CN306	1-691-461-11	SOCKET. CONNECTOR 7P		L301	1-408-777-00	INDUCTOR CHIP 10UH	
CN307	1-506-468-11	PIN. CONNECTOR 3P		<TRANSISTOR>			
<COMPOSITION CIRCUIT BLOCK>				Q1	8-729-230-49	TRANSISTOR 2SC2712-YG	
CPD301	1-233-188-11	COMPOSITION CIRCUIT BLOCK		Q2	8-729-230-49	TRANSISTOR 2SC2712-YG	
CPD302	1-239-230-11	COMPOSITION CIRCUIT BLOCK		Q3	8-729-230-49	TRANSISTOR 2SC2712-YG	
CPR301	1-233-164-11	COMPOSITION CIRCUIT BLOCK		Q4	8-729-230-49	TRANSISTOR 2SC2712-YG	
CPR302	1-232-986-11	COMPOSITION CIRCUIT BLOCK		Q5	8-729-230-49	TRANSISTOR 2SC2712-YG	
CPR303	1-233-165-11	COMPOSITION CIRCUIT BLOCK		Q6	8-729-230-49	TRANSISTOR 2SC2712-YG	
CPR304	1-232-976-11	COMPOSITION CIRCUIT BLOCK		Q7	8-729-216-22	TRANSISTOR 2SA1162-G	
CPR305	1-232-976-11	COMPOSITION CIRCUIT BLOCK		Q8	8-729-230-49	TRANSISTOR 2SC2712-YG	
<DIODE>				Q9	8-729-230-49	TRANSISTOR 2SC2712-YG	
D1	8-719-105-91	DIODE RD5. 6M-B2		Q10	8-729-230-49	TRANSISTOR 2SC2712-YG	
D2	8-719-801-78	DIODE ISS184		Q11	8-729-230-49	TRANSISTOR 2SC2712-YG	
D301	8-719-801-78	DIODE ISS184		Q12	8-729-230-49	TRANSISTOR 2SC2712-YG	
D302	8-719-801-78	DIODE ISS184		Q13	8-729-230-49	TRANSISTOR 2SC2712-YG	
D303	8-719-105-91	DIODE RD5. 6M-B2		Q14	8-729-230-49	TRANSISTOR 2SC2712-YG	
D304	8-719-105-91	DIODE RD5. 6M-B2		Q15	8-729-216-22	TRANSISTOR 2SA1162-G	
D305	8-719-105-52	DIODE RD3. 6M-B2		Q16	8-729-230-49	TRANSISTOR 2SC2712-YG	
D306	8-719-106-44	DIODE RD9. 1M-T1B2		Q17	8-729-230-49	TRANSISTOR 2SC2712-YG	
<FERRITE BEAD>				Q18	8-729-230-49	TRANSISTOR 2SC2712-YG	
FB1	1-410-397-21	FERRITE BEAD INDUCTOR		Q19	8-729-901-00	TRANSISTOR DTC124EK	
FB2	1-410-397-21	FERRITE BEAD INDUCTOR		Q201	8-729-901-05	TRANSISTOR DTA124EK	
FB3	1-410-397-21	FERRITE BEAD INDUCTOR		Q202	8-729-901-05	TRANSISTOR DTA124EK	
FB101	1-410-397-21	FERRITE BEAD INDUCTOR		Q203	8-729-216-22	TRANSISTOR 2SA1162-G	
<FILTER>				Q204	8-729-230-49	TRANSISTOR 2SC2712-YG	
FL1	1-409-431-11	COIL. TRAP		Q205	8-729-101-07	TRANSISTOR 2SB798-DL	
FL2	1-409-447-11	COIL. TRAP		Q206	8-729-140-75	TRANSISTOR 2SD999-CLCK	
FL3	1-236-129-11	ENCAPSULATED COMPONENT		Q207	8-729-140-75	TRANSISTOR 2SD999-CLCK	
FL301	1-236-129-11	ENCAPSULATED COMPONENT		Q301	8-729-901-00	TRANSISTOR DTC124EK	
FL302	1-235-096-00	FILTER. LINE		Q302	8-729-901-00	TRANSISTOR DTC124EK	
FL303	1-235-096-00	FILTER. LINE		Q303	8-729-230-49	TRANSISTOR 2SC2712-YG	
<IC>				Q304	8-729-901-00	TRANSISTOR DTC124EK	
IC1	8-759-304-10	IC HA11465A		Q305	8-729-230-49	TRANSISTOR 2SC2712-YG	
IC2	8-759-300-71	IC HD14053BFP		Q306	8-729-230-49	TRANSISTOR 2SC2712-YG	
IC3	8-759-051-50	I TL5501CDWA		Q307	8-729-901-05	TRANSISTOR DTA124EK	
IC4	8-759-051-51	IC MB40776PF		Q308	8-729-140-75	TRANSISTOR 2SD999-CLCK	

When indicating parts by reference number, please include the board name.

Ref. No	Part No.	Description	Remark	Ref. No	Part No.	Description	Remark
<RESISTOR>							
R1	1-216-029-00	METAL GLAZE 150	5% 1/10W	R61	1-216-065-00	METAL GLAZE 4.7K	5% 1/10W
R2	1-216-029-00	METAL GLAZE 150	5% 1/10W	R62	1-216-041-00	METAL GLAZE 470	5% 1/10W
R3	1-216-073-00	METAL GLAZE 10K	5% 1/10W	R63	1-216-049-00	METAL GLAZE 1K	5% 1/10W
R4	1-216-073-00	METAL GLAZE 10K	5% 1/10W	R64	1-216-063-00	METAL GLAZE 3.9K	5% 1/10W
R5	1-216-025-00	METAL GLAZE 100	5% 1/10W	R65	1-216-053-00	METAL GLAZE 1.5K	5% 1/10W
R6	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R66	1-216-061-00	METAL GLAZE 3.3K	5% 1/10W
R7	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W	R67	1-216-049-00	METAL GLAZE 1K	5% 1/10W
R8	1-216-033-00	METAL GLAZE 220	5% 1/10W	R68	1-216-053-00	METAL GLAZE 1.5K	5% 1/10W
R9	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R69	1-216-059-00	METAL GLAZE 2.7K	5% 1/10W
R10	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W	R70	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W
R11	1-216-037-00	METAL GLAZE 330	5% 1/10W	R71	1-216-021-00	METAL GLAZE 68	5% 1/10W
R12	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R72	1-216-073-00	METAL GLAZE 10K	5% 1/10W
R13	1-216-025-00	METAL GLAZE 100	5% 1/10W	R73	1-216-071-00	METAL GLAZE 8.2K	5% 1/10W
R14	1-216-073-00	METAL GLAZE 10K	5% 1/10W	R74	1-216-033-00	METAL GLAZE 220	5% 1/10W
R15	1-216-073-00	METAL GLAZE 10K	5% 1/10W	R75	1-216-021-00	METAL GLAZE 68	5% 1/10W
R16	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R76	1-216-073-00	METAL GLAZE 10K	5% 1/10W
R17	1-216-025-00	METAL GLAZE 100	5% 1/10W	R77	1-216-061-00	METAL GLAZE 3.3K	5% 1/10W
R18	1-216-065-00	METAL GLAZE 4.7K	5% 1/10W	R90	1-216-033-00	METAL GLAZE 220	5% 1/10W
R19	1-216-045-00	METAL GLAZE 680	5% 1/10W	R98	1-216-313-00	METAL GLAZE 8.2	5% 1/10W
R20	1-216-095-00	METAL GLAZE 82K	5% 1/10W	R99	1-216-313-00	METAL GLAZE 8.2	5% 1/10W
R21	1-216-079-00	METAL GLAZE 18K	5% 1/10W	R101	1-216-121-00	METAL GLAZE 1M	5% 1/10W
R22	1-216-067-00	METAL GLAZE 5.6K	5% 1/10W	R102	1-216-121-00	METAL GLAZE 1M	5% 1/10W
R23	1-216-071-00	METAL GLAZE 8.2K	5% 1/10W	R103	1-216-013-00	METAL GLAZE 33	5% 1/10W
R24	1-216-067-00	METAL GLAZE 5.6K	5% 1/10W	R104	1-216-013-00	METAL GLAZE 33	5% 1/10W
R25	1-216-073-00	METAL GLAZE 10K	5% 1/10W	R105	1-216-049-00	METAL GLAZE 1K	5% 1/10W
R26	1-216-067-00	METAL GLAZE 5.6K	5% 1/10W	R106	1-216-025-00	METAL GLAZE 100	5% 1/10W
R27	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R107	1-216-013-00	METAL GLAZE 33	5% 1/10W
R28	1-216-031-00	METAL GLAZE 180	5% 1/10W	R108	1-216-013-00	METAL GLAZE 33	5% 1/10W
R29	1-216-097-00	METAL GLAZE 100K	5% 1/10W	R109	1-216-013-00	METAL GLAZE 33	5% 1/10W
R30	1-216-105-00	METAL GLAZE 220K	5% 1/10W	R110	1-216-013-00	METAL GLAZE 33	5% 1/10W
R31	1-216-065-00	METAL GLAZE 4.7K	5% 1/10W	R111	1-216-013-00	METAL GLAZE 33	5% 1/10W
R32	1-216-065-00	METAL GLAZE 4.7K	5% 1/10W	R112	1-216-013-00	METAL GLAZE 33	5% 1/10W
R33	1-216-075-00	METAL GLAZE 12K	5% 1/10W	R113	1-216-013-00	METAL GLAZE 33	5% 1/10W
R34	1-216-083-00	METAL GLAZE 27K	5% 1/10W	R201	1-216-099-00	METAL GLAZE 120K	5% 1/10W
R35	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W	R202	1-216-091-00	METAL GLAZE 56K	5% 1/10W
R36	1-216-053-00	METAL GLAZE 1.5K	5% 1/10W	R203	1-216-081-00	METAL GLAZE 22K	5% 1/10W
R37	1-216-067-00	METAL GLAZE 5.6K	5% 1/10W	R204	1-216-013-00	METAL GLAZE 33	5% 1/10W
R38	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W	R205	1-216-093-00	METAL GLAZE 68K	5% 1/10W
R39	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W	R206	1-216-033-00	METAL GLAZE 220	5% 1/10W
R40	1-216-041-00	METAL GLAZE 470	5% 1/10W	R207	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W
R41	1-216-041-00	METAL GLAZE 470	5% 1/10W	R208	1-216-067-00	METAL GLAZE 5.6K	5% 1/10W
R42	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R210	1-216-295-00	METAL GLAZE 0	5% 1/10W
R43	1-216-045-00	METAL GLAZE 680	5% 1/10W	R211	1-216-053-00	METAL GLAZE 1.5K	5% 1/10W
R44	1-216-045-00	METAL GLAZE 680	5% 1/10W	R212	1-216-308-00	METAL GLAZE 4.7	5% 1/10W
R45	1-216-045-00	METAL GLAZE 680	5% 1/10W	R213	1-216-308-00	METAL GLAZE 4.7	5% 1/10W
R46	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R214	1-216-049-00	METAL GLAZE 1K	5% 1/10W
R47	1-216-037-00	METAL GLAZE 330	5% 1/10W	R215	1-216-065-00	METAL GLAZE 4.7K	5% 1/10W
R48	1-216-037-00	METAL GLAZE 330	5% 1/10W	R216	1-216-055-00	METAL GLAZE 1.8K	5% 1/10W
R49	1-216-057-00	METAL GLAZE 2.2K	5% 1/10W	R217	1-216-065-00	METAL GLAZE 4.7K	5% 1/10W
R50	1-216-073-00	METAL GLAZE 10K	5% 1/10W	R218	1-216-065-00	METAL GLAZE 4.7K	5% 1/10W
R51	1-216-067-00	METAL GLAZE 5.6K	5% 1/10W	R219	1-216-029-00	METAL GLAZE 150	5% 1/10W
R52	1-216-097-00	METAL GLAZE 100K	5% 1/10W	R220	1-216-069-00	METAL GLAZE 6.8K	5% 1/10W
R53	1-216-023-00	METAL GLAZE 82	5% 1/10W	R301	1-216-061-00	METAL GLAZE 3.3K	5% 1/10W
R54	1-216-119-91	METAL GLAZE 820K	5% 1/10W	R302	1-216-037-00	METAL GLAZE 330	5% 1/10W
R55	1-216-075-00	METAL GLAZE 12K	5% 1/10W	R303	1-216-029-00	METAL GLAZE 150	5% 1/10W
R56	1-216-061-00	METAL GLAZE 3.3K	5% 1/10W	R304	1-216-073-00	METAL GLAZE 10K	5% 1/10W
R57	1-216-055-00	METAL GLAZE 1.8K	5% 1/10W	R305	1-216-047-00	METAL GLAZE 820	5% 1/10W
R58	1-216-073-00	METAL GLAZE 10K	5% 1/10W	R306	1-216-023-00	METAL GLAZE 82	5% 1/10W
R59	1-216-061-00	METAL GLAZE 3.3K	5% 1/10W	R307	1-216-101-00	METAL GLAZE 150K	5% 1/10W
R60	1-216-049-00	METAL GLAZE 1K	5% 1/10W	R308	1-216-077-00	METAL GLAZE 15K	5% 1/10W
				R309	1-216-081-00	METAL GLAZE 22K	5% 1/10W

When indicating parts by reference number, please include the board name.

Ref.No	Part No.	Description	Remark			Ref.No	Part No.	Description	Remark		
R310	1-216-097-00	METAL GLAZE 100K	5%	1/10W		*1-641-596-11	SU-2 BOARD	*****			
R311	1-216-063-00	METAL GLAZE 3.9K	5%	1/10W							
R312	1-216-073-00	METAL GLAZE 10K	5%	1/10W				<CONNECTOR>			
R313	1-216-073-00	METAL GLAZE 10K	5%	1/10W							
R314	1-216-049-00	METAL GLAZE 1K	5%	1/10W		CN601	1-506-481-11	PIN. CONNECTOR 2P			
R315	1-216-049-00	METAL GLAZE 1K	5%	1/10W				*****			
R316	1-216-037-00	METAL GLAZE 330	5%	1/10W							
R317	1-216-081-00	METAL GLAZE 22K	5%	1/10W							
R318	1-216-057-00	METAL GLAZE 2.2K	5%	1/10W		*1-641-593-11	PTC-21 BOARD	*****			
R319	1-216-061-00	METAL GLAZE 3.3K	5%	1/10W				<CAPACITOR>			
R320	1-216-061-00	METAL GLAZE 3.3K	5%	1/10W							
R321	1-216-033-00	METAL GLAZE 220	5%	1/10W		C501	1-163-038-00	CERAMIC CHIP 0.1MF	25V		
R322	1-216-061-00	METAL GLAZE 3.3K	5%	1/10W		C502	1-163-038-00	CERAMIC CHIP 0.1MF	25V		
R323	1-216-025-00	METAL GLAZE 100	5%	1/10W				<CONNECTOR>			
R324	1-216-025-00	METAL GLAZE 100	5%	1/10W							
R325	1-216-033-00	METAL GLAZE 220	5%	1/10W							
R326	1-216-041-00	METAL GLAZE 470	5%	1/10W		CN501	*1-949-469-11	HARNESS (C)			
R327	1-216-097-00	METAL GLAZE 100K	5%	1/10W				<TRANSISTOR>			
R328	1-216-049-00	METAL GLAZE 1K	5%	1/10W							
R329	1-216-061-00	METAL GLAZE 3.3K	5%	1/10W		Q501	8-719-988-59	PHOTO TRANSISTOR PT501-A			
R332	1-216-061-00	METAL GLAZE 3.3K	5%	1/10W		Q502	8-729-019-26	PT493F			
R333	1-216-049-00	METAL GLAZE 1K	5%	1/10W				<RESISTOR>			
R334	1-216-295-00	METAL GLAZE 0	5%	1/10W							
		<VARIABLE RESISTOR>				R501	1-216-025-00	METAL GLAZE 100	5%	1/10W	
RV1	1-238-240-11	RES. ADJ CERMET		220		R502	1-216-025-00	METAL GLAZE 100	5%	1/10W	
RV2	1-238-090-11	RES. ADJ CERMET		10K				*****			
RV201	1-238-092-11	RES. ADJ CERMET		47K							
		<RELAY>				*1-641-594-11	LE-6 BOARD	*****			
RY1	1-515-614-11	RELAY				3-689-205-01	HOLDER (A). LED				
		<SWITCH>						<CONNECTOR>			
S301	1-572-999-11	SWITCH. SLIDE									
S302	1-571-907-31	SWITCH. DIP				CN521	*1-949-470-11	HARNESS (D)			
		<CRYSTAL>						<DIODE>			
X101	1-567-881-11	VIBRATOR. CRYSTAL				D521	9-910-999-31	DIODE GL-520			
		*****						<RESISTOR>			
	*1-641-592-11	SE-9 BOARD				R521	1-216-295-00	METAL GLAZE 0	5%	1/10W	
		*****						*****			
SUM3	1-690-506-11	CORE. FLAT TYPE (7 CORE)									
		*****				*1-641-598-11	S-20 BOARD	*****			
								<DIODE>			
	*1-641-595-11	C-18 BOARD				D401	8-719-802-29	DIODE TLG211-GH			
		*****				D402	8-719-800-39	DIODE TLY211			
		<CONNECTOR>				D403	8-719-984-66	DIODE GL420			
CN511	*1-949-467-11	HARNESS (A)						<RESISTOR>			
		<DIODE>									
D511	8-719-975-18	DIODE GP1S51				R401	1-216-025-00	METAL GLAZE 100	5%	1/10W	
		<RESISTOR>				R402	1-216-025-00	METAL GLAZE 100	5%	1/10W	
						R403	1-216-025-00	METAL GLAZE 100	5%	1/10W	
						R404	1-216-025-00	METAL GLAZE 100	5%	1/10W	
R511	1-216-295-00	METAL GLAZE 0	5%	1/10W		R405	1-216-025-00	METAL GLAZE 100	5%	1/10W	
		*****									

When indicating parts by refer-

ence number, please include

the board name.

Less than 15891 (UP-860)  
Less than 35201 (UP-870MD)

S-20 M

Ref.No	Part No.	Description	R
<VARIABLE RESISTOR>			
RV401	1-237-776-11	RES. VAR. CARBON	10K
RV402	1-237-776-11	RES. VAR. CARBON	10K
<SWITCH>			
S401	1-570-865-11	SWITCH. SLIDE	
S402	1-570-865-11	SWITCH. SLIDE	
S403	1-554-303-21	SWITCH. KEY BOARD	
S404	1-554-303-21	SWITCH. KEY BOARD	
S405	1-554-303-21	SWITCH. KEY BOARD	
SUM1	1-690-504-11	WIRE. FLAT TYPE (7 CORE)	
SUM2	1-690-505-11	CORE. FLAT TYPE (8 CORE)	
*****			
Δ #1-413-694-11	SWITCHING REGULATOR(SOPS-1028)		
*****			
Δ #1-533-213-31	HOLDER. FUSE		
Δ #1-949-490-11	HARNESS 1028A		
Δ #1-949-491-11	HARNESS 1028C		
*A-4915-252-A	MOUNTED PCB, M		
*****			
<CAPACITOR>			
C801	Δ 1-136-185-00	FILM 0.22MF 20%	250V
C802	1-136-185-00	FILM 0.22MF 20%	250V
C803	Δ 1-161-973-00	CERAMIC 220PF 10%	400V
C804	1-161-973-00	CERAMIC 220PF 10%	400V
C805	1-161-973-00	CERAMIC 220PF 10%	400V
C806	1-161-742-00	CERAMIC 2200PF 20%	400V
C807	1-161-742-00	CERAMIC 2200PF 20%	400V
C808	1-136-165-00	FILM 0.1MF 5%	50V
C809	Δ 1-125-715-11	ELECT 820MF	
C810	1-102-002-00	CERAMIC 680PF 10%	500V
C811	1-102-002-00	CERAMIC 680PF 10%	500V
C812	1-124-122-11	ELECT 100MF 20%	50V
C813	1-126-803-11	ELECT 47MF 20%	50V
C814	1-136-165-00	FILM 0.1MF 5%	50V
C815	1-130-479-00	FILM 0.0047MF 5%	50V
C901	1-162-318-11	CERAMIC 1000PF 10%	500V
C902	1-162-318-11	CERAMIC 1000PF 10%	500V
C903	1-124-602-00	ELECT 2200MF 20%	35V
C904	1-124-602-00	ELECT 2200MF 20%	35V
C905	1-126-146-11	ELECT 1000MF 20%	35V
C907	1-136-173-00	FILM 0.47MF 5%	50V
C908	1-162-318-11	CERAMIC 1000PF 10%	500V
C910	1-124-760-11	ELECT 2200MF 20%	10V
C911	1-126-373-11	ELECT 470MF 20%	10V
C912	1-136-173-00	FILM 0.47MF 5%	50V
C914	1-162-318-11	CERAMIC 1000PF 10%	500V
C915	1-126-589-11	ELECT 2200MF 20%	16V
C916	1-126-316-51	ELECT 470MF 20%	16V
C917	1-136-173-00	FILM 0.47MF 5%	50V
C918	1-102-228-00	CERAMIC 470PF 10%	500V
C919	1-102-228-00	CERAMIC 470PF 10%	500V
C920	1-130-483-00	FILM 0.01MF 5%	50V
C921	1-130-493-00	FILM 0.068MF 5%	50V
C922	1-130-012-00	FILM 330PF 5%	50V
C923	1-126-233-11	ELECT 22MF 20%	50V
C924	1-136-169-00	FILM 0.22MF 5%	50V
C925	1-130-481-00	FILM 0.0068MF 10%	50V

Ref.No	Part No.	Description	Remark
<CONNECTOR>			
CN801	Δ 1-560-549-00	V CONNECTOR. BASE PIN 3P	
CN901	1-564-241-00	CONNECTOR. (B4P-VH) 4P	
CN902	1-560-893-00	CONNECTOR. 5P	
<DIODE>			
D801	Δ 8-719-510-22	DIODE D3SB60	
D802	8-719-928-08	DIODE ERD28-04S	
D803	8-719-313-16	DIODE AU02A	
D804	8-719-987-87	DIODE ERA85-009	
D805	8-719-911-19	DIODE ISS119	
D806	8-719-110-49	DIODE RD18ES-T1B2	
D901	8-719-981-44	DIODE ESAD92M-02	
D902	8-719-313-16	DIODE AU02A	
D904	8-719-510-41	DIODE D10SC9M	
D905	8-719-110-04	DIODE RD7.5ESB1	
D906	8-719-109-54	DIODE RD2.2ES-T1B2	
D907	8-719-911-19	DIODE ISS119	
D908	8-719-110-49	DIODE RD18ES-T1B2	
D909	8-719-160-71	DIODE RD20FB2	
D910	8-719-948-59	DIODE ERB93-02	
D911	8-719-911-19	DIODE ISS119	
<FUSE>			
F801	Δ 1-532-749-11	FUSE. 4A	
<FERRITE BEAD>			
FB901	1-543-060-00	CORE	
FB902	1-543-060-00	CORE	
FB903	1-543-060-00	CORE	
FB904	1-543-060-00	CORE	
FB905	1-543-060-00	CORE	
FB906	1-543-060-00	CORE	
FB907	1-543-060-00	CORE	
<IC>			
IC801	Δ 1-809-086-11	HIC CH-1018	
IC901	8-759-520-23	IC FA5304P	
IC902	8-759-908-15	IC TL431CLP	
<COIL>			
L801	Δ 1-424-352-11	COIL. LFT	
L802	Δ 1-424-058-11	COIL. LFT	
L803	Δ 1-424-611-11	CHOKE COIL	
L901	1-424-255-11	CHOKE COIL 10uH	
L903	1-424-255-11	CHOKE COIL 10uH	
L904	1-424-255-11	CHOKE COIL 10uH	
<IC>			
PH801	Δ 8-759-045-81	IC TLP732GR-LF2	
<TRANSISTOR>			
Q801	Δ 8-729-013-06	TRANSISTOR IRFP448	
Q802	8-719-108-30	CYRISTOR 3P4MH	
Q901	8-729-321-74	TRANSISTOR 2SK1306	

When indicating parts by reference number, please include the board name.

The components identified by shading and mark Δ are critical for safety.  
Replace only with part number specified.

Les composants identifiés par une trame et une marque Δ sont critiques pour la sécurité.  
Ne les remplacer que par une pièce portant le numéro spécifié.



Ref.No	Part No.	Description	Remark	Ref.No	Part No.	Description	Remark
<RESISTOR>				MISCELLANEOUS			
R801	△ 1-202-723-00	SOLID	2.2M 10%	*****			
R802	△ 1-217-783-11	SEMENT	4.7 5%	△ *1-413-694-13	SWITCHING REGULATOR(SOPS-1028)		
R803	1-249-417-11	CARBON	1K 5%	1-543-879-11	HEAD, THERMAL (KST-100-9MPL14-SN)		
R804	1-260-083-11	CARBON	47 5%	M951 1-541-309-11	MOTOR, L (RF-370C)		
R805	1-215-900-11	METAL	22K 5%	M952 1-541-309-11	MOTOR, L (RF-370C)		
R806	1-215-900-11	METAL	22K 5%	1-551-475-31	CABLE ASSY		
R807	1-249-439-11	CARBON	68K	1-554-512-00	SWITCH, MICRO		
R808	1-249-439-11	CARBON	68K	1-690-503-11	WIRE, FLAT TYPE (24CORE)		
R809	1-215-885-00	METAL	68 5%	*1-949-467-11	HARNESS (A)		
R810	1-215-885-00	METAL	68 5%	*1-949-468-11	HARNESS (B)		
R811	△ 1-217-625-00	METAL PLATE 0.05	10%	*1-949-469-11	HARNESS (C)		
R812	1-249-400-11	CARBON	39	*1-949-470-11	HARNESS (C)		
R813	1-249-397-11	CARBON	22 5%	*1-949-471-11	HARNESS (E)		
R814	1-249-403-11	CARBON	68 5%	*1-949-472-11	HARNESS (F)		
R815	1-249-403-11	CARBON	68 5%	*1-949-473-12	HARNESS (G)		
R816	1-249-439-11	CARBON	68K	*****			
R901	1-215-880-00	METAL	10 5%	ACCESSORY & PACKING MATERIALS			
R902	1-249-405-11	CARBON	100 5%	*****			
R903	1-205-776-00	SEMENT	470 5%	*3-173-904-01	CUSHON		
R904	1-215-880-00	METAL	10 5%	*3-173-902-01	INDIVIDUAL CARTON..UP-860(UC)		
R905	1-215-880-00	METAL	10 5%	*3-173-905-01	INDIVIDUAL CARTON..UP-870MD		
R906	1-215-880-00	METAL	10 5%	3-701-623-01	BAG, POLYETHYLENE		
R907	1-217-625-00	METAL PLATE 0.05	10%	3-701-630-00	BAG, POLYETHYLENE		
R908	1-249-397-11	CARBON	22 5%	3-754-175-11	MANUAL, INSTRUCTION..UP-860(UC)		
R909	1-249-391-11	CARBON	6.8 5%	3-754-175-21	MANUAL, INSTRUCTION..UP-870MD		
R910	1-249-432-11	CARBON	18K 5%	1-551-475-31	CABLE ASSY		
R911	1-249-422-11	CARBON	2.7K 5%	1-534-827-14	CORD, POWER..UP-860(UC)		
R912	1-249-418-11	CARBON	1.2K 5%	1-558-527-11	CORD, POWER..UP-870MD		
R913	1-249-435-11	CARBON	33K 5%	1-693-002-11	REMOTE COMMANDER (RM-91)		
R914	1-249-397-11	CARBON	22 5%	*****			
R915	1-249-417-11	CARBON	1K 5%	HARDWARE LIST			
R916	1-249-433-11	CARBON	22K 5%	*****			
R917	1-249-424-11	CARBON	3.9K 5%	<PRECISION>			
R918	1-249-422-11	CARBON	2.7K 5%	7-627-556-08	PRECISION +P 2.6X2.8		
R919	1-249-426-11	CARBON	5.6K 5%	<SCREW>			
R920	1-249-413-11	CARBON	470 5%	7-621-255-55	+P 2X8		
R921	1-215-889-00	METAL	330 5%	7-628-253-90	+PS 2.6X4		
R922	1-215-892-11	METAL	1K 5%	7-682-248-04	+K 3X8		
<VARIABLE RESISTOR>				7-682-645-04	+PS 3X4		
RV901	1-237-500-21	RES. ADJ CARBON 1K FROM(T)B		7-682-647-09	+PS 3X6		
RV902	1-228-989-00	RES. ADJ CARBON 500 FROM(F)B		7-682-648-01	PS 3X8		
RV903	1-241-757-11	RES. ADJ 1K		7-682-661-09	+PSW 4X8		
<SWITCH>				7-682-949-01	+PSW 3X10		
SW801	△ 1-692-015-11	AC PUSH SWITCH		<TAPPING>			
<TRANSFORMER>				7-682-547-04	+BVT 3X6 (S)		
T801	△ 1-450-758-11	CONVERTER. 1028A		7-685-546-14	+B 3X8, TYPE 2, N-S		
T901	△ 1-450-761-11	CONVERTER. 1028B		<NUT>			
*****				7-684-023-04	N3, TYPE 2		
<WASHER>				7-623-422-07	LW3, TYPE B		

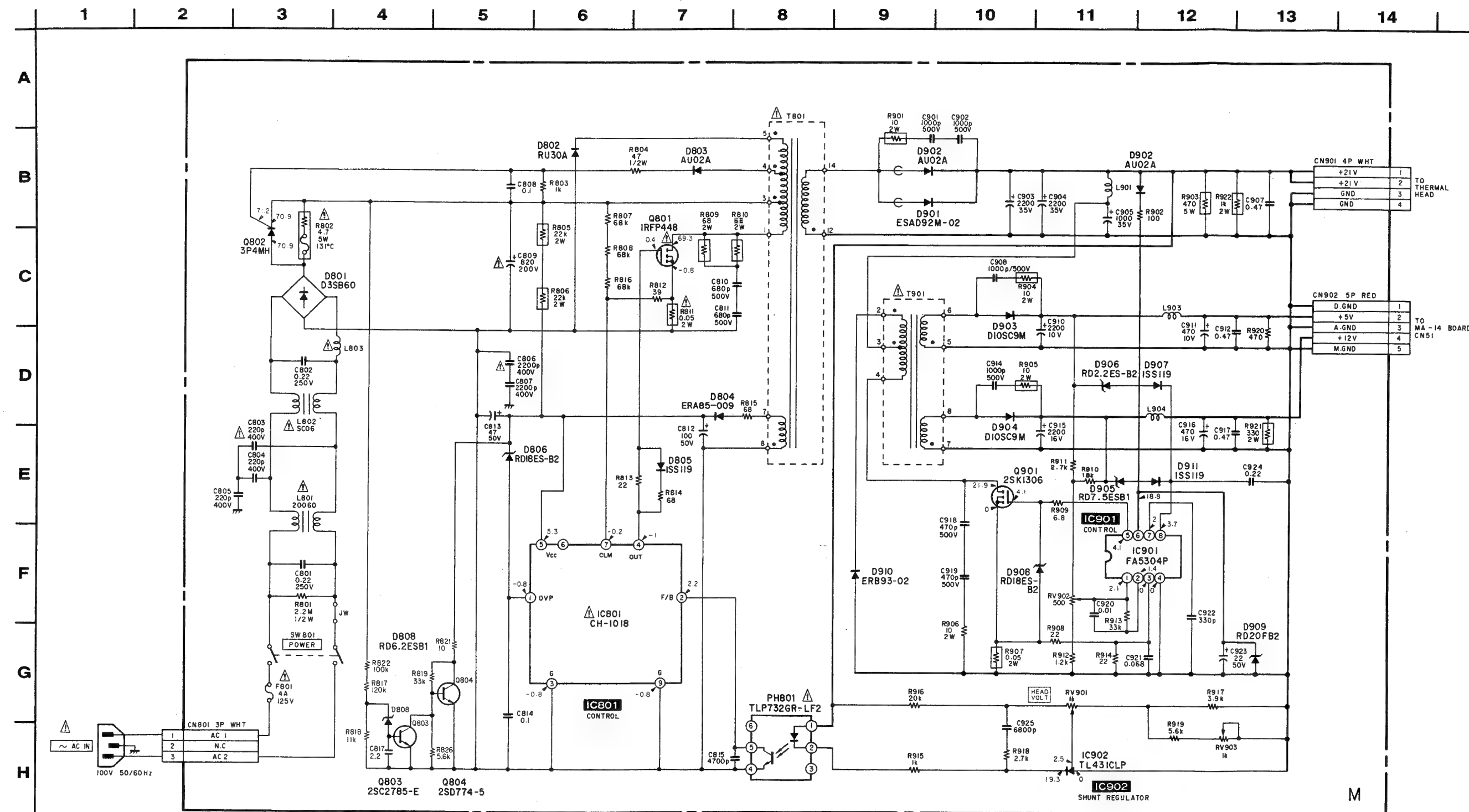
When indicating parts by reference number, please include the board name.

The components identified by shading and mark △ are critical for safety. Replace only with part number specified.

Les composants identifiés par une trame et une marque △ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

M (POWER SUPPLY)

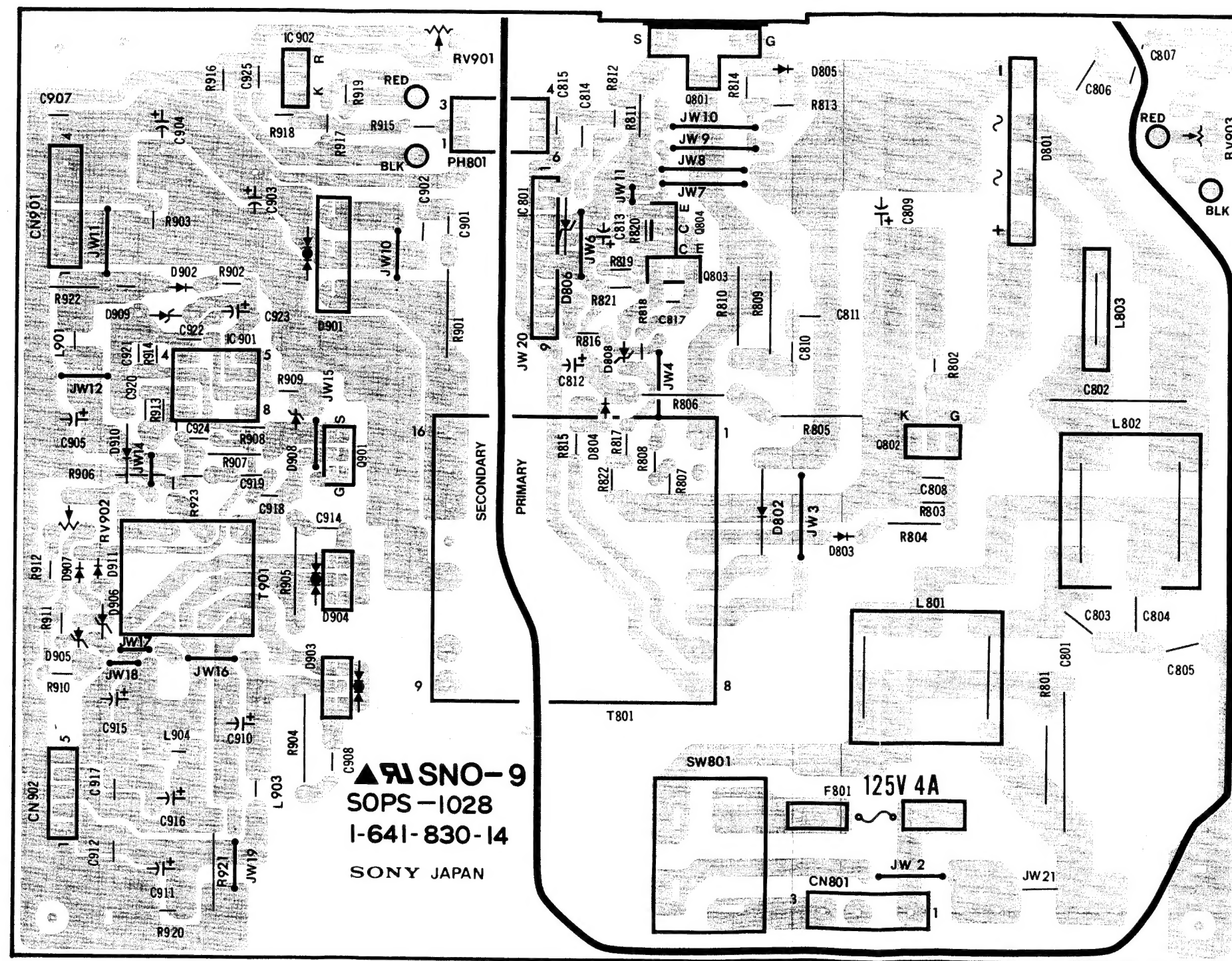
15891 and later (UP-860)  
35201 and later (UP-870MD)





M (POWER SUPPLY)

15891 and later (UP-860)  
35201 and later (UP-870MD)



15891 and later (UP-860)  
35201 and later (UP-870MD)

# ELECTRICAL PARTS LIST

M

## NOTE:

• Items marked "\*" are not stocked because they are seldom required for routine servicing. Some delay should be expected when ordering these items.

• All variable and adjustable resistors have characteristic curve B, unless otherwise stated.

## RESISTORS

• All resistors are in ohms  
• F: non-flammable

When indicating part by reference number, please include the board name.

## CAPACITORS

• MF:  $\mu$ F, PF:  $\mu$ PF

## COILS

• MMH: mH, UH:  $\mu$ H

The components identified by shading and mark  $\Delta$  are critical for safety. Replace only with part number specified.

Les composants identifiés par une trame et une marque  $\Delta$  sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Ref. No	Part No.	Description	Remark	Ref. No	Part No.	Description	Remark
	$\Delta$ *1-413-694-14	SWITCHING REGULATOR(SOPS-1028)				<CONNECTOR>	
		*****		CN801	$\Delta$ 1-560-549-00	V CONNECTOR, BASE PIN 3P	
	$\Delta$ *1-533-213-31	HOLDER, FUSE		CN901	1-564-241-00	CONNECTOR (B4P-VH) 4P	
	$\Delta$ *1-949-490-11	HARNESS 1028A		CN902	1-560-893-00	CONNECTOR 5P	
	$\Delta$ *1-949-491-11	HARNESS 1028C				<DIODE>	
	*A-4915-252-A	MOUNTED PCB, M		D801	$\Delta$ 8-719-510-22	DIODE D3SB60	
		<CAPACITOR>		D802	8-719-312-72	DIODE RU30A	
C801	$\Delta$ 1-136-185-00	FILM	0.22MF 20% 250V	D803	8-719-313-16	DIODE AU02A	
C802	1-136-185-00	FILM	0.22MF 20% 250V	D804	8-719-987-87	DIODE ERA85-009	
C803	$\Delta$ 1-161-973-00	CERAMIC	220PF 10% 400V	D805	8-719-911-19	DIODE 1SS119	
C804	1-161-973-00	CERAMIC	220PF 10% 400V	D806	8-719-110-49	DIODE RD18ES-B2	
C805	1-161-973-00	CERAMIC	220PF 10% 400V	D808	8-719-109-93	DIODE RD6.2ES-B2	
C806	$\Delta$ 1-161-742-00	CERAMIC	2200PF 20% 400V	D901	8-719-981-44	DIODE ESAD92M-02	
C807	1-161-742-00	CERAMIC	2200PF 20% 400V	D902	8-719-313-16	DIODE AU02A	
C808	1-136-165-00	FILM	0.1MF 5% 50V	D903	8-719-510-41	DIODE D10SC9M	
C809	$\Delta$ 1-125-715-11	ELECT	820MF 20% 200V	D904	8-719-510-41	DIODE D10SC9M	
C810	1-102-002-00	CERAMIC	680PF 10% 500V	D905	8-719-110-04	DIODE RD7.5ESB1	
C811	1-102-002-00	CERAMIC	680PF 10% 500V	D906	8-719-109-54	DIODE RD2.2ES-B2	
C812	1-124-122-11	ELECT	100MF 20% 50V	D907	8-719-911-19	DIODE 1SS119	
C813	1-126-803-11	ELECT	47MF 20% 50V	D908	8-719-110-49	DIODE RD18ES-B2	
C814	1-136-165-00	FILM	0.1MF 5% 50V	D909	8-719-160-71	DIODE RD20FB2	
C815	1-130-479-00	FILM	0.0047MF 5% 50V	D910	8-719-948-59	DIODE ERB93-02	
C817	1-124-925-11	ELECT	2.2MF 20% 50V	D911	8-719-911-19	DIODE 1SS119	
C901	1-162-318-11	CERAMIC	1000PF 10% 500V			<FUSE>	
C902	1-162-318-11	CERAMIC	1000PF 10% 500V	F801	$\Delta$ 1-532-746-11	FUSE 4A	
C903	1-124-602-00	ELECT	2200MF 20% 35V			<FERRITE BEAD>	
C904	1-124-602-00	ELECT	2200MF 20% 35V	FB801	1-543-060-00	CORE	
C905	1-126-146-11	ELECT	1000MF 20% 35V	FB901	1-543-060-00	CORE	
C907	1-136-173-00	FILM	0.47MF 5% 50V	FB902	1-543-060-00	CORE	
C908	1-162-318-11	CERAMIC	1000PF 10% 500V	FB903	1-543-060-00	CORE	
C910	1-124-760-11	ELECT	2200MF 20% 10V	FB904	1-543-060-00	CORE	
C911	1-126-373-11	ELECT	470MF 20% 10V	FB905	1-543-060-00	CORE	
C912	1-136-173-00	FILM	0.47MF 5% 50V	FB906	1-543-060-00	CORE	
C914	1-162-318-11	CERAMIC	1000PF 10% 500V	FB907	1-543-060-00	CORE	
C915	1-126-589-11	ELECT	2200MF 20% 16V			<IC>	
C916	1-126-316-51	ELECT	470MF 20% 16V	IC801	$\Delta$ 1-809-086-12	HIC CH-1018	
C917	1-136-173-00	FILM	0.47MF 5% 50V	IC901	8-759-520-23	IC FA5304P	
C918	1-102-228-00	CERAMIC	470PF 10% 500V	IC902	8-759-908-15	IC TL431CLP	
C919	1-102-228-00	CERAMIC	470PF 10% 500V			<COIL>	
C920	1-130-483-00	FILM	0.01MF 5% 50V	L801	$\Delta$ 1-424-352-11	LFT	
C921	1-130-493-00	FILM	0.068MF 5% 50V	L802	$\Delta$ 1-424-058-11	LFT	
C922	1-130-012-00	FILM	330PF 5% 50V	L803	$\Delta$ 1-424-611-11	CHOKE COIL	
C923	1-126-233-11	ELECT	22MF 20% 50V				
C924	1-136-169-00	FILM	0.22MF 5% 50V				
C925	1-130-481-00	FILM	0.0068MF 10% 50V				

**M**

The components identified by shading and mark **Δ** are critical for safety. Replace only with part number specified.

Les composants identifiés par une trame et une marque **Δ** sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Ref.No	Part No.	Description	Remark
L901	1-424-255-11	CHOKE COIL 10uH	
L903	1-424-255-11	CHOKE COIL 10uH	
L904	1-424-255-11	CHOKE COIL 10uH	
		<PHOTO COUPLER>	
PH801	<b>Δ</b> 8-759-045-81	TLP732GR-LF2	
		<TRANSISTOR>	
Q801	<b>Δ</b> 8-729-013-06	TRANSISTOR IRFP448	
Q802	8-719-108-30	CYRISTOR 3P4MH	
Q804	8-729-140-96	TRANSISTOR 2SD774-34	
Q901	8-729-321-74	TRANSISTOR 2SK1306	
		<RESISTOR>	
R801	<b>Δ</b> 1-202-723-00	SOLID 2.2M 10% 1/2W	
R802	<b>Δ</b> 1-217-783-11	FUSE 4.7 5% 5W	
R803	1-249-417-11	CARBON 1K 5% 1/4W	
R804	1-260-083-11	CARBON 47 5% 1/2W	
R805	1-215-900-11	METAL 22K 5% 2W	
R806	1-215-900-11	METAL 22K 5% 2W	
R807	1-249-439-11	CARBON 68K 5% 1/4W	
R808	1-249-439-11	CARBON 68K 5% 1/4W	
R809	1-215-885-00	METAL 68 5% 2W	
R810	1-215-885-00	METAL 68 5% 2W	
R811	<b>Δ</b> 1-217-625-00	METAL PLATE 0.05 10% 2W	
R812	1-249-400-11	CARBON 39 5% 1/4W	
R813	1-249-397-11	CARBON 22 5% 1/4W	
R814	1-249-403-11	CARBON 68 5% 1/4W	
R815	1-249-403-11	CARBON 68 5% 1/4W	
R816	1-249-439-11	CARBON 68K 5% 1/4W	
R817	1-215-471-00	METAL 120K 1% 1/4W	
R818	1-215-464-00	METAL 11K 1% 1/4W	
R819	1-215-457-00	METAL 33K 1% 1/4W	
R820	1-215-439-00	METAL 5.6K 1% 1/4W	
R821	1-249-393-11	CARBON 10 5% 1/4W	
R822	1-215-469-00	METAL 100K 1% 1/4W	
R901	1-215-880-00	METAL 10 5% 2W	
R902	1-249-405-11	CARBON 100 5% 1/4W	
R903	1-205-776-00	CEMENT 470 5% 5W	
R904	1-215-880-00	METAL 10 5% 2W	
R905	1-215-880-00	METAL 10 5% 2W	
R906	1-215-880-00	METAL 10 5% 2W	
R907	1-217-625-00	METAL PLATE 0.05 10% 2W	
R908	1-249-397-11	CARBON 22 5% 1/4W	
R909	1-249-391-11	CARBON 6.8 5% 1/4W	
R910	1-249-432-11	CARBON 18K 5% 1/4W	
R911	1-249-422-11	CARBON 2.7K 5% 1/4W	
R912	1-249-418-11	CARBON 1.2K 5% 1/4W	
R913	1-249-435-11	CARBON 33K 5% 1/4W	
R914	1-249-397-11	CARBON 22 5% 1/4W	
R915	1-249-417-11	CARBON 1K 5% 1/4W	
R916	1-215-452-00	METAL 20K 5% 1/4W	
R917	1-249-424-11	CARBON 3.9K 5% 1/4W	
R918	1-249-422-11	CARBON 2.7K 5% 1/4W	
R919	1-249-426-11	CARBON 5.6K 5% 1/4W	
R920	1-249-413-11	CARBON 470 5% 1/4W	
R921	1-215-889-00	METAL 330 5% 2W	
R922	1-215-892-11	METAL 1K 5% 2W	
R923	1-219-213-11	FUSE 0.033 10% 0.33W	

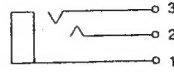
Ref.No	Part No.	Description	Remark
		<VARIABLE RESISTOR>	
RV901	1-237-500-21	RES. ADJ CARBON 1K B	
RV902	1-228-989-00	RES. ADJ CARBON 500 B	
RV903	1-241-757-11	RES. ADJ CARBON 1K	
		<SWITCH>	
SW801	<b>Δ</b> 1-554-880-11	AC PUSH SWITCH	
		<TRANSFORMER>	
T801	<b>Δ</b> 1-450-758-11	CONVERTER 1028A	
T901	<b>Δ</b> 1-450-761-11	CONVERTER 1028B	

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## SPECIFICATIONS

Thermal head	Thin-film thermal head (with built-in drive IC) 896-dot drive	
Graduations	256	
Effective pixels	EIA	CCIR
	NORM: 808 × 472 dots	808 × 560 dots
	WIDE: 848 × 490 dots	848 × 582 dots
	WIDE: 896 × 508 dots	896 × 608 dots
Print size	EIA	CCIR
	NORM: 90 × 69 mm	90 × 69 mm
	WIDE: 95 × 72 mm	95 × 71 mm
	WIDE: 100 × 75 mm	100 × 75 mm
Printing speed	About 19 seconds/screen (aspect ratio 4:3)	
Picture memory	573K × 6 bits	
Input/output connectors	VIDEO IN (BNC)	
	EIA or CCIR	
	Composite video signals	
	1.0V <sub>p-p</sub> , 75 ohms/high-impedance (EIA/CCIR automatically discriminated)	
VIDEO OUT (BNC)	EIA or CCIR	
	Composite video signals	
	1.0V <sub>p-p</sub> , 75 ohms, loop-through/EE switchblade	
	REMOTE (stereo minijack)*	
Power requirements	120 VAC, 50/60 Hz	
Power consumption	Max. 166A	
Dimensions	154 × 105 × 300 mm (w/h/d)	
	(6 1/8 × 4 1/8 × 11 7/8 inches)	
	not including projecting parts and controls	
Weight	About 6.6 kg (7 lb 15 oz) Main unit only	
Supplied accessories	Paperroll (UPP-110HD) (1)	
	BNC-BNC connecting cable (1)	
	AC power cord (1)	
	Head cleaning sheet (1)	
	UP-87MD; Remote commander RM-91 (1)	

### \* Technical specifications



- 1 GND
- 2 PRINT SIGNAL (TTL)  
Input of LOW pulse over 100 msec. initiate print.
- 3 PRINT BUSY (TTL)  
Goes HIGH during printing

Design and specifications are subject to change without notice.